December 1992 Issue #17

Radio Fun

BULK RATE
U.S. POSTAGE
PAID
PERMIT #1
MANCHESTER, NH

$2.00

"The beginner's guide to the exciting world of amateur radio."

in this issue

features

4 Trap Dipoles NH6XK
6 Let Everyone Know You're "On-The-Air" N1II

reviews

24 The Pico-J W1XU

vintage review

12 Kenwood TR-7400A 2m Transceiver WA1GUD

departments

26 Activities Calendar Staff
17 Ad Index Staff
14 Antennas, Etc. K4IPV
8 Computers in the Shack N1EWO
28 Flea Market Staff
5 Letters Staff
28 New Products Staff
8 Radio Magic WB8VGE
20 The Tech Side KB1UM
22 Try Something New WB8ELK
29 Uncle Wayne's Bookshelf Staff
18 Upgrade . . . Don't Stop Now WB6NOA
16 What Next? WB2MGP

New York State Fair Special Events Station

About 100 upstate New York hams joined together to operate the 1992 New York State Fair Special Events Station in Syracuse, New York. Staffing covered the 12 days from August 27 through September 7, 1992, between the hours of 10 a.m. and 8 p.m. The station was jointly sponsored by the Liverpool Amateur Repeater Club (LARC) and the Dill's Landing Wireless Society of Camillus, New York. The station operated under the callsign of LARC President Bud Berthold W2GLN and was coordinated during all 12 days by LARC Vice President Dennis Smith N2MTR. The station site was in and around the New York Central caboose that is part of the exhibit of cars and engines displayed by the Central New York Chapter of the National Railway Historical Society.

The objectives of the Special Events Station were:

•To increase the visibility of amateur radio to the general public;

•To increase the number of hams participating in amateur radio activities;

•To expose the many new area hams to their first taste of HF operating opportunities; and

•To give many of the old-timers a chance to demonstrate their operating and public-relations skills.

A wide variety of equipment was utilized to facilitate operations on HF, VHF/UHF-FM, covering SSB, CW, RTTY, AMTOR and packet. During the fair, about 300 contacts were made with other amateurs around the world, and thousands of people attending the fair had an opportunity to get a close-up look at amateur radio in action. A special feature provided fair-goers an opportunity to "send" their name in Morse code and then receive a personalized certificate attesting to their achievement. At times, kids and their parents were lined up to try their hand at the provided key. A large chart showed the Morse code characters for each letter. The Dill's Landing Wireless Society provided a continuously running video tape on the pleasures of ham radio, with information about their classes for new hams through the Camillus Parks and Recreation Department. This, along with the packet and RTTY operations, was inside the caboose where fair-goers were welcome.

Plans for next year include more of the same, but with an expansion to bring more clubs and individuals to participate in a cooperative effort. The New York State Fair is the perfect place to put amateur radio in the public eye. *TNX Dave Brooks KA2VEE.*

Photo A. An overview of the New York State Fair special events station, next to the NYC caboose. Other equipment was inside the caboose. (Photo courtesy of John W. Luebs N2PMQ.)

SAREX QSL Information

The Dayton Amateur Radio Association (DARA) has agreed to distribute the QSL cards for the STS-50 mission. Keith Baker KB1SF from DARA will be coordinating this effort. All STS-50 QSL cards received at the ARRL, the Goddard ARC and at the JSC ARC should be forwarded to DARA at Box 44, Dayton OH 45401. For your convenience, Frank Bauer KA3HDO has compiled the addresses of the QSL distributors for the STS-35, 37, 45 and 47 missions. These are as follows:

STS-35, 37
Frank Bauer KA3HDO
9609 Tuckerman Ct.
Seabrook MD 20706

STS-45
Sterling Park ARC
P.O. Box 599
Sterling VA 22170

STS-47
Jay Apt N5QWL
806 Shorewood Drive
Seabrook TX 77586

The status of the various cards and their distribution is:

Mission	Launch Date	QSL Distribution Status
STS-35	December 1990	QSL distribution complete.
STS-37	April 1991	All who included SASEs for STS-37 should have received their QSL by now. One to three QSL requests are still being received per day.
STS-45	March 1992	QSL distribution just beginning.
STS-50	June 1992	QSL currently being printed. QSL distribution expected to start in approximately four to six weeks.
STS-47	September 1992	QSL layout should be starting soon.

To receive a QSL, SAREX participants must include the QSO information (e.g. date, time in UTC, frequency, mode) which documents the contact or listener report. In addition, a large business-sized SASE is required for those who wish to receive a card. No cards will be distributed without the proper postage affixed or sufficient IRCs included. *TNX SpaceNews, Monday October 26, 1992; Frank H. Bauer KA3HDO.*

Amateur Radio Leads the Way

Only a couple of hours after the winds had started to subside and Hurricane Andrew's devastation was apparent, members of the Florida National Guard, 705th Military Police Company from Cocoa, were moving to south Dade County to establish security and provide aid to the stricken. Specialist Clayton Bennett of Palm Bay, an electrical technician for 23 years at Harris Semiconductor in Melbourne, had brought his ham radio.

Photo B. Clayton Bennett KA4NHW of Palm Bay, Florida, uses a Kenwood TM-231 2 meter transceiver to augment the U.S. Army RT524A 30-75 MHz tactical radio.

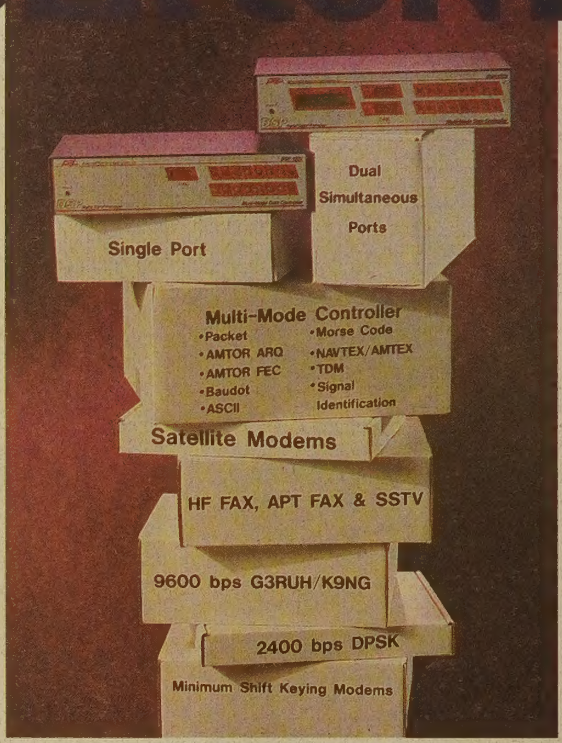
As a military policeman this was not part of his job but as a ham radio operator it was an instinct.

Bennett, whose callsign is KA4NHW, was able to establish a communications link in Homestead to relay messages to the Homestead and Florida City Police Stations from the Miami Emergency Operations Center (EOC). By monitoring the air waves he was also able to identify some of the sites that had special needs. Many of the disaster shelters were low on specific medical items that were later supplied by National Guard helicopters. Once Bennett's presence and abilities were known, hams from other areas helped by providing additional equipment, such as stronger power supplies and better antennas, to increase his capabilities.

Spec. Bennett has proven not only the flexibility of Guardsmen but the dedication of amateur radio operators to pitch in and assist whenever the going gets tough. *TNX Major Doug Wiles, Task Force Andrew Public Affairs Officer; story by Captain Fleet Pride.*

WE'VE GOT EVERYTHING UNDER CONTROL

FREE "GET STARTED In PACKET" book with purchase of any AEA packet controller!
10/1/92 – Good to – 2/28/93



In the world of multi-mode contollers, nothing tops the DSP-2232 or DSP-1232 from AEA. When you choose either the dual port DSP-2232 or single port DSP-1232, you'll have just what you need to couple HF or VHF/UHF (or both) transceivers with a personal computer or computer terminal. Each converts incoming analog signals into digital data by means of a 12-bit, high speed converter.

Developed by AEA — with over 10 years of multi-mode controller development experience — the DSP-2232/1232 are the most advanced and versatile controllers available anywhere. They give you the capability to control all legal Amateur digital modes popular on both HF and VHF. New modems only require new software which can be installed with an EPROM chip, or downloaded from a telephone BBS binary file into the DSP's RAM. You won't need to replace your DSP-2232 or DSP-1232 as no new hardware or modifications will be needed as new modes become available.

Whatever you've thought about doing in Amatuer radio, it's here in the DSP-2232/1232. All PK-232 MBX modems (Packet, AMTOR, etc.). All satellite modems (PSK, 4800 bps PACSAT, G3RUH 9600 bps, U022 equalized, 400 bps OSCAR-13). Analog modems for HF FAX, FAX APT, and SSTV. 9600 bps K9NG/G3RUH for terrestrial and satellite use. Each also offers internal RAM for uploading modems, up to 36 simultaneous packet connections, EPROM up to 2 Mbits, software selectable radio ports, Mailbox accessible through both ports, dedicated printer port, RTTY digital noise gate, ARQ tolerance command, etc.

The DSP-2232 adds even more control with its dual port gateway, front panel LCD showing connect and packets status, retrieval, call sign connected to, last call monitored and "marquee" display of received RTTY signals.

Get control of your digital operating position with the DSP-2232 or DSP-1232 from AEA. You'll be on top of the Amatuer radio world, too.

To connect with the AEA dealer nearest you or for product sheets, call (800) 432-8873.

Advanced Electronic Applications, Inc.
PO Box C2160, 2006 - 196th St. SW, Lynnwood, WA 98036 Sales: (206) 774-5554

AEA
Connect with us

Youth Forum Interviewees Needed

Carole Perry WB2MGP is seeking articulate, active amateur radio youngsters up to age 18 to be interviewed for various youth forums across the country. Please contact Carole at P.O. Box 131646, Staten Island NY 10313-0006, or call her at (718) 983-1416.

Communications Act Revisions

The House Congressional Record reports three *Communications Act* revisions mandated by the *Telecommunications Authorization Act of 1992* that impact amateur radio:

1) An amendment concerning "Signing of License Applications" clears the way for electronic filing of amateur radio operator license applications;

2) The three-year statute of limitations between violation and issuance of a forfeiture (FCC administrative fine) notice is to be eliminated; and

3) "The Commission for purposes of providing radio clubs and military-recreational callsigns, may utilize the voluntary, uncompensated and reimbursed services of amateur radio organizations authorized by the Commission that have tax-exempt status under Section 501(c)(3) of the Internal Revenue Code of 1986." *TNX W5YI Report, Vol. 14, Issue #21, November 1, 1992.*

FCC Can Deny Certification of Scanner Equipment

According to an article contained in the October 3, 1992, *Washington Post*, a " . . . new law will order the FCC to deny certification of scanner equipment that receives cellular frequencies or can be easily altered by the user to do so. The legislation is expected to be passed as part of a bill regulating abuses of 900 numbers." It is already against the law to listen in on cellular phone calls but the Justice Dept. concedes that the law is virtually unenforceable. "Most scanning equipment now blocks out cellular frequencies, but they can be modified easily . . ." *TNX W5YI Report, Vol. 14, Issue #21, November 1, 1992.*

Amateur Killed in Hurricane Relief

Herbert Engelman KD4OZY of Lake Worth, Florida, died Wednesday, September 2, 1992, as a direct result of his activities in Hurricane Andrew relief.

Engelman, 55, a night school administrator in Palm Beach County, was struck by lightening on Sunday, August 30, a week after the hurricane struck, while helping unload an Army helicopter near a distribution center in Homestead. A witness told the *Palm Beach Post* that Engelman was "using a hand-held radio to relay information to a mobile ham radio operator" when he ran out to meet the helicopter during a thunderstorm.

Manny Papandreas W4SS, ARRL Section Emergency Coordinator for South Florida, told the *Post* that Engelman was one of about a hundred amateurs from as far away as New York who brought radio equipment to Dade County "to relieve radio operators there."

The newspaper reported that "Ham operators are stationed at food distribution centers, relaying information among distribution sites, emergency operations headquarters and the regional staging area at the South Florida Fairgrounds in West Palm Beach.

"Most volunteers are members of the American Radio Relay League and have mutual aid agreements," the newspaper said.

Engelman, who moved to Florida from Missouri about 10 years ago, taught adult and disabled students. He was a medic and a Navy SEAL in Vietnam, and was past commander of a VFW post in Neosho, Missouri.

More than 120 people attended his funeral on September 4 at the First Congregational Church of Lake Worth, according to the *Post*.

Engelman leaves his wife, Helen Engelman; two adult daughters; and five grandchildren. Memorial donations in his name may be made to the American Lung Association. *TNX The ARRL Letter, Volume 11, No. 17; Broward Amateur Radio Club Bulletin, October 1992.*

ASTRON CORPORATION

9 Autry
Irvine, CA 92718
(714) 458-7277

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

MODEL VS-50M

SPECIAL FEATURES
- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS
- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

• LOW PROFILE POWER SUPPLY

MODEL	Colors Gray	 Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2¾ x 7⅝ x 9¾	11

RS-L SERIES

• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7

RM SERIES

MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	 Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

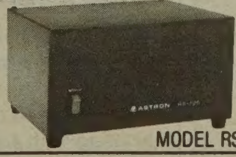
VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	 @10VDC	 @5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES


MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	 Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

CIRCLE 16 ON READER SERVICE CARD

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

Trap Dipoles

Home-brewed, inexpensive multiband antennas.

by Dean Frazier NH6XK

What's more fun than a simple dipole? Why, a multiband trap dipole, of course. And now with Solar Cycle 22 on the decline, what better time to upgrade your license and put up an inexpensive antenna to get on the lower bands, as 10 meters goes into intermittent hibernation?

Most of us are "taught" that traps are lossy and should be avoided. It is true that a trap made from very small wire, close-wound, will experience unacceptable current losses, but if the turns are wide-spaced, and if larger wire is used, losses can be kept to a minimum. The advantages of multiband operation are obvious.

Trap dipoles are not all that difficult to build and make work, and their construction cost is minimal. You can work the world on them.

The Trap Dipole

A trap, consisting of a coil of inductance L in parallel with a capacitor C, the lot in series with a radiator of varying RF energy, does several things. The trap has a natural resonant frequency, f_O, governed by the values of L and C, at which frequency the trap presents a high impedance. This will become significant later. Above f_o the trap acts as a capacitor, while below it the trap acts as an inductor. "Capacitive Loading" as it is called, electrically shortens the antenna, while "Inductive Loading" electrically lengthens the antenna. An electrically shortened antenna is physically longer than it would be without the electrical shortening; an electrically lengthened one is physically shorter.

These three phenomena—a trap's resonant frequency and high impedance at that frequency, its ability to electrically shorten (X_C) an antenna, and its ability to electrically lengthen (X_L) an antenna—allow us to make an antenna operate on more than one band, as an antenna's natural resonant frequency is a function of its electrical length.

So you're convinced a properly made trap dipole (or trap-any-antenna, since most are variations on dipoles) may have some merit? What's the fuss all about? Why not just buy one ready-made, or make one from someone else's design? Why design and build one yourself? For me the latter is the most fun: when you sit down and generate a design, and then build it, and discover that it works.

What follows is my method for accomplishing just that . . . building a trap dipole to work on specific bands. But first, a bit of designing is in order.

Design Your Own Traps

Suppose you desire a trap dipole which will operate on 10 through 80 meters. If the antenna were an electrical quarter wave on 80, then all the other main bands would be possible as they are multiples of such a quarter wave, and the WARC bands should be achievable with a transmatch. Now, to be a quarter wave on 80 meters forces the antenna electrically to be a half wave on 40 meters. This becomes our starting point in design. See the sidebar for band and fractional wavelength values.

The design itself is straightforward: A half wave on 40 meters is about 65 feet. Half of this, for each leg of the dipole, out to the traps, is 32.5 feet. Call this length "A." See Figure 1.

We make the traps such that they are resonant at 7.2 MHz, thus offering a high impedance to a 40 meter (7.2 MHz) signal, effectively divorcing sections "B," the remaining length of wire on each leg of the antenna, from the antenna. The result, from coil to coil, is a half-wave 40 meter dipole.

Next, we choose a value of capacitance C for trap resonance at 7.2 MHz. Experience has shown that 100 pF works well at this frequency. Of course, we must use a capacitor (one in each coil) which will handle our power requirements; 5,000-volt DC transmitting capacitors are recommended.

Then, recalling that

$$f_o = \frac{1}{2\pi\sqrt{LC}}$$

we solve for the inductance L required for resonance:

$$L = \frac{1}{4\pi^2 f^2 C} = \frac{1}{4\pi^2 (7.2)^2 (100)} = 4.9\ \mu\text{H}$$

We thus need to design a coil (two exactly the same, one for each leg of our antenna), of 4.9 µH each. A coil of #12 or #14 AWG wire wound to the correct length, of the correct number of turns, on 2-1/2" PVC tubing, serves our purpose. The capacitor can be housed in the tube.

But how long should our coil be? How many turns of wire? Again, we resort to a formula. A fairly good approximation for inductance L as a function of an air-wound coil's diameter d (inches), length ℓ (inches) and number of turns of wire, n, is as follows:

$$L = \frac{d^2 n^2}{18d + 40\ell}$$

Stated another way:

$$n = \frac{\sqrt{L(18d + 40\ell)}}{d}$$

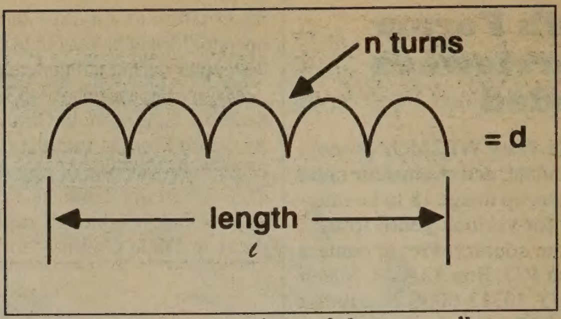


Figure 2. Dimensions of the trap coils.

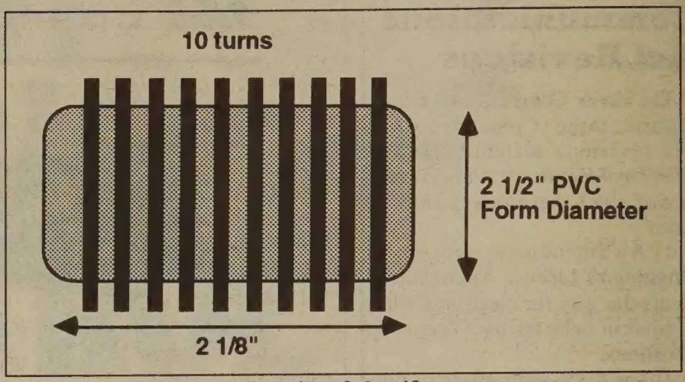


Figure 3. Details of the 40 meter trap.

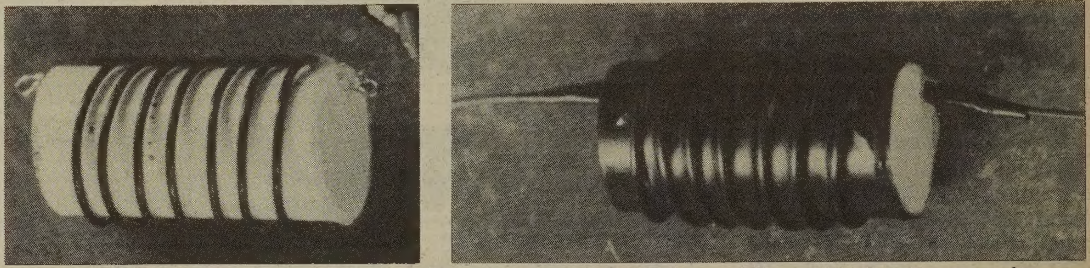


Photo A. (left) The trap coil is wound as shown on a PVC form. After soldering the capacitor in place, seal the ends with plastic disks and hot glue. (right) The final trap shown soldered in place on the antenna and wrapped with electrical tape for protection.

See Figure 2. If we make $\ell = 2.125$ inches, knowing d = 2.5 inches, then:

$$n = \frac{\sqrt{4.9(18(2.5) + 40(2.125))}}{2.5} = 10 \text{ turns}$$

This turns out to be not quite five turns per inch of coil.

See Figure 3. How much wire do we use up in a coil? Well, each turn uses $\frac{2.5 \times \pi}{12}$ feet of wire, and

$$10 \text{ turns uses } \frac{2.5 \times \pi}{12}\ 10 = 6.55 \text{ feet.}$$

Now all we need to do is figure the remaining antenna leg length B. To do so is easy if we realize that the distance from the feed point to the end of the antenna needs to be an electrical quarter wave on (in this example) 80 meters, and we've already used up wire in the coil and on the inner antenna leg A.

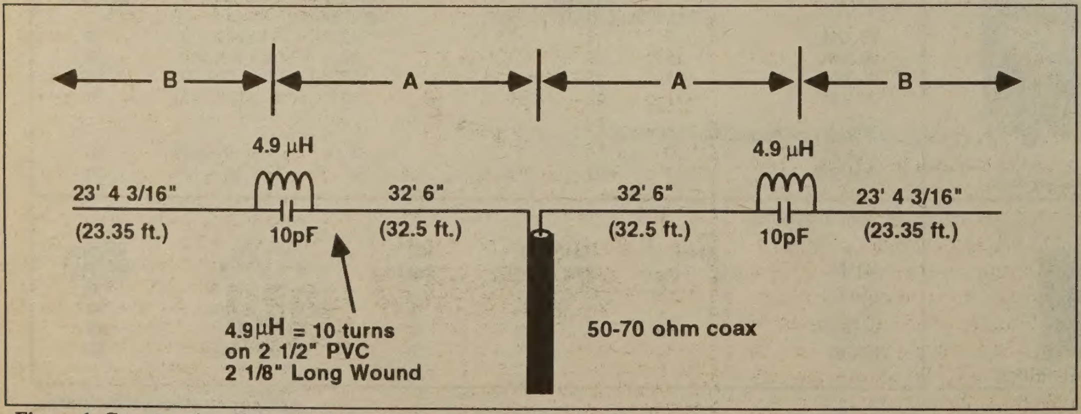


Figure 1. Construction diagram of the 80-10 meter trap dipole. Use the dimensions in Table 1 for smaller versions.

$$\frac{\lambda}{4\,(80 \text{ meters})} = \frac{468}{2\,(3.75 \text{ MHz})} =$$

$$\begin{array}{r} 62.40 \text{ feet} \\ -32.50 \text{ feet (A)} \\ -\ 6.55 \text{ feet (coil)} \\ \hline B = 23.35 \text{ feet} \end{array}$$

See Figure 1 for the final trap dipole design.

After this rather long and esoteric design dissertation, relax: For other combinations of bands I've done the calculations for you. See Table 1 for the various design parameters you need to build your own trap dipole.

Construction Details

Wind the required number of turns to the required length on 2-1/2" o.d. PVC tubing and fix the wire in place. Holes drilled in the ends of the tube through which the wire is passed serve as strain relief. The capacitor is soldered from coil end to coil end, and housed inside the tube. The PVC tube ends may be capped for watertightness, and electrical tape can be wrapped around the outside of the coil and wire. Alternatively, the entire trap may be housed in a lightweight plastic container. Much construction ingenuity and creativity is possible here.

Tuning/Trimming

Ideally, one builds a trap and then stretches or compresses the coil windings to either raise or lower (respectively) the trap's resonant frequency, checking with a grid dip oscillator, noise bridge, or frequency counter. Failing these devices, one can get a fair measure of how close to the design resonant frequency the trap is (with leg A in place) by applying low power and noting the SWR at the antenna feed point (or at the transceiver, provided the coax feed line is a multiple of a half wave on the design frequency), and making a plot of SWR as a function of frequency to determine where the SWR curve "bottoms out." Most hams use this latter method.

So what do you do if you find that your almost finished antenna (we have not added lengths B yet) shows lowest SWR at (say) 7.0 MHz when you wanted 7.2 MHz? You must shorten legs A, on each side of the feed point, equally. Detuning agents (wood, metal) in the field of the antenna are causing it to resonate low in frequency.

A very quick way to get near your final goal is to predict the amount of trimming required, in the following manner: If you find, for example, your lowest SWR is at 7.0 MHz, then you are 0.2 MHz "low." Then:

$$\frac{468\,(0.2)}{(7.2)^2} = 1.8 \text{ feet}$$

$$\frac{\lambda}{2} \text{ length change } = \frac{468 \text{ (MHz freq. difference)}}{(\text{freq. MHz})^2}$$

The half-wave dipole is 1.8 feet too long . . . this amounts to 0.9', or 10-13/16", too long on each side. Simply *take out* 10-13/16" on each side of the antenna, in sections A, between the feed point and the traps. If your lowest SWR frequency is above that desired, calculate as above, but *add* this

Continued on page 10

Radio Fun

DECEMBER 1992
issue #17

editor/publisher
Wayne Green W2NSD/1
associate publisher
David Cassidy N1GPH

managing editor
Bill Brown WB8ELK
production editor
Hope Currier
editorial associates
Sue Jewell
Joyce Sawtelle
contributing editors
Mike Bryce WB8VGE
Joseph E. Carr K4IPV
Michael Geier KB1UM
Carole Perry WB2MGP
Jeffrey Sloman N1EWO
Gordon West WB6NOA

advertising sales representatives
Dan Harper
Sue Colbert
advertising coordinator
Judy Walker
1–603–924-0058
1–800–274-7373
FAX (603) 924-9327

graphic design
Suzanne Self
desktop page make-up
Linda Drew
Alice Scofield

circulation manager
Harvey Chandler

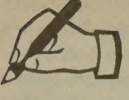
Wayne Green, Inc.
editorial offices
Radio Fun
70 Route 202-North
Peterborough, NH 03458
(603) 924-0058
FAX: (603) 924-9327

RADIO FUN (ISSN 1055-887X) is published monthly by Radio Fun, a division of Wayne Green, Inc., 70 Route 202-N, Peterborough NH 03458. Subscriptions: $14.00 per year. Canada add $8.00. Foreign add $12.00 surface/$32.00 airmail. Second class postage pending at Peterborough NH and additional mailing offices.

POSTMASTER: Send address corrections to RADIO FUN, P.O. Box 4926, Manchester NH 03108.

Entire contents ©1992 by Radio Fun. No part of this publication may be reproduced without written permission of the publisher.

letters



Write to: Radio Fun, 70 Route 202-N, Peterborough, NH 03458

Collier McDermon KC6WJM, Buena Park CA Mr. Cassidy, your article in the August 1992 issue of *Radio Fun* (page 3) was an answer to a prayer. I too share your well-stated concern regarding certain hams (not all old-timers, either) who try, convict and execute our new no-code technicians without the benefit of a trial or even a "hearing." True, some of the new no-coders need instruction regarding proper operating practices. This problem is one of education and demonstration by the old-timers of how to proceed, coupled with a lot of patience.

I must take this opportunity to direct your attention to a gentleman who continually demonstrates the very essence of the perfect Elmer. He is Randy Oates WB6ESQ and is the current president of the Buena Park Amateur Radio Club here in Southern California. Randy goes about his Elmer duties quietly, with never any fanfare, encouraging all hams, new and old, with words and, more importantly, deeds. He has given radios, antennas, keys, and whatever else may be needed to get the new licensee on the air. Then he follows up by helping install and tune the gear. What more could anyone do to advance the good reputation of amateur radio?

> **"As a relatively new ham I have been most fortunate to receive wonderful help from many old-timers."**

As a relatively new ham I have been most fortunate to receive wonderful help from many old-timers. I have been a recipient of Randy's caring helpfulness on more than one occasion. He well deserves our accolades and applause. Please assist me in any manner you may deem appropriate to say thanks to this giving and generous friend.

Lori L. Moore KD4QWR, Maysville KY I am writing in response to David Cassidy N1GPH's editorial in the August 1992 issue. I took my initial testing (no-code Tech) for an amateur radio license on May 3, 1992. The following evening, May 4th, I attended my first meeting of the Greater Mason County Amateur Radio Association (GMCARA). During this meeting, all members who had upgraded at that testing session were asked to stand and be recognized and tell what they had passed. Although I was not a member of the club, I was also recognized.

This was my introduction to GMCARA! I have found all members to be exceptionally cordial and welcoming to all amateurs, regardless of license class.

Before my license had even arrived in the mail, one club member had loaned me an HF receiver, another their Morse code practice tapes. Three club members have had me over to see their "shack" and, in the true spirit of amateur radio, immediately put me on the air!

I have since taken the written General theory test, and passed my 5 wpm code test. I have had a lot of encouragement from club members, and hopefully will pass the 13 wpm on my next try.

I was asked to be Net Control shortly after I received my license. I declined, however, wishing to wait until I had some more on-the-air experience.

I am telling you this because I wish to convey the message that in the GMCARA club there isn't any code/no-code battle at all! I have nothing but praise for this club. Everyone is welcome here.

New blood, whether code or no-code, is always a benefit to any club. We bring new insight and fresh ideas. Anyone who has a problem with no-code Techs probably has a problem with a lot of other trivial insignificant things, and just needs something to gripe about to fill their otherwise empty life.

Laurent "Larry" Borde FD1PYI, Maclas, France I have been an amateur since last year. My rig is an IC-725, at 230 four elements monoband 10m and a five-band Comet bi-dipole, with a C-64 for RTTY QSOs.

During my first year of activity I've been able to get my five-band DXCC reached; I hope to get it confirmed soon. I still need a few more on 75m. My highest score is on 10m, where I have reached nearly 260 different DXCCs!

Anyway, that's proof that with a few watts and a dipole we can have great DXs all around the world. Of course, I used to wait for my time on big pile-ups! By the way, all big shots of the past year are in the log.

I've also been active in the Indian Ocean in early 1992, where I was using my FR/FD1PYI call, but unfortunately I was not able to get any on Mauritius, where I got married last June. But I'm still trying to get a license from that island and surely it will be OK in a few months.

Travel is my second hobby. That gives me the idea to activate a rare DXCC in the future. "Wait and see," as a famous guy said.

My job is a camping area keeper. We rent caravans at 1,200 feet above sea level in central southeast France, 45 minutes south of Lyon, with a beautiful view of the Alps 180 miles away! We are also growing apple trees, the main product in this area. RF

MFJ's world famous
Ham Radio
Accessories

Why do more hams throughout the world use MFJ accessories than any other brand? Because they are value packed and carry MFJ's one year unconditional guarantee!

MFJ Speaker Mics
Compact or miniature models for all popular HTs

Compact Speaker Mics, $24.95 each:
Once you try an MFJ Speaker Mic you'll never want to be without it. You'll be able to carry your handheld on your belt and never have to remove it to monitor calls or talk.
You'll never have to turn up your audio annoyingly loud to monitor calls because it's handy lapel/pocket clip lets you keep it close to your ear for easy listening.
And you'll never have to clumsily remove your handheld from your belt holder to talk because you can conveniently take the speaker mic in one hand, press the push to talk button and talk. Measure 1¼'' x 2'' x 3''
They come with a lightweight retractable cord that eliminates the dangling cord problem. They feature excellent audio on both transmit and receive. **MFJ-284 for Icom or Yaesu; MFJ-286 for Kenwood.**
MFJ-284 or MFJ-286 $24.95

Miniature Speaker Mics, $24.95 each:
New miniature speaker mics pack all the features of the compact models into a tiny 2'' x 1¼'' x ¼'' package. The lapel pocket clip swivels for even more convenient positioning. Also features transmit LED. Choose from regular or ''L'' shaped connector. Order **MFJ-285 or MFJ-285L for Icom or Yaesu, MFJ-287 or MFJ-287L for Kenwood. MFJ-283 for dual plug Alinco.**
MFJ-283, MFJ-285, MFJ-285L, MFJ-287 or MFJ-287L $24.95

Deluxe 300 W Tuner
MFJ-949D $149.95
MFJ-949D is the world's most popular 300 watt PEP tuner. It covers 1.8-30 MHz, gives you a new peak and average reading Cross-Needle SWR/Wattmeter, built-in dummy load, 6 position antenna switch and 4:1 balun -- in a compact 10 x 3 x 7 inch cabinet. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

SWR Analyzer
MFJ-207 $99.95
MFJ's innovative new SWR Analyzer gives you a complete picture of your antenna SWR over an entire band -- without a transmitter, SWR meter or any other equipment.!
Simply plug your antenna into the coax connector, set your SWR Analyzer to the frequency you want and read your SWR. You can instantly find your antenna's true resonant frequency,something a noise bridge can't do. Covers 1.8-30 MHz (or choose **MFJ-208, $89.95** for 2 Meters). Use 9 V battery or 110 VAC with MFJ-1312, $12.95.

VHF SWR/Wattmeter
MFJ-812B $29.95
Covers 2 Meters and 220 MHz. 30 or 300 Watt scales. Also reads relative field strength 1-170 MHz and SWR above 14 MHz. 4½x2¼x3 in.

MFJ Multiple DC Outlet
MFJ-1112 $29.95
New MFJ DC Power Outlet saves you space **and** money. Hook it to your 12 VDC power supply and get 6 DC outlets for connecting your accessories. RF bypassing keeps RF out of power supply from DC line outlet. 13½x2¾x2½ in.

12/24 Hour LCD Clocks
$19.95 MFJ-108B $9.95 MFJ-107B
Huge 5/8 inch bold LCD digits let you see the time from anywhere in your shack. Choose from the dual clock that has separate UTC/local time display or the single 24 hour ham clock.
Mounted in a brushed aluminum frame. Easy to set. The world's most popular ham clocks for accurate logs. MFJ-108B 4½x1x2;MFJ-107B 2¼x1x2 in.

MFJ Cross-Needle SWR/Wattmeter
MFJ-815B $69.95
MFJ Cross-Needle SWR/Wattmeter has a new **peak** reading function! It shows you SWR, forward and reflected power in 2000/500 and 200/50 watt ranges. Covers 1.8-30 MHz.
Mechanical zero adjusts for movement. SO-239 connectors. Lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Deluxe Code Practice Oscillator
MFJ-557 $24.95
MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base so it stays put on your table. Portable because it runs on a 9-volt battery (not included) or an AC adapter ($12.95) that plugs into a jack on the side.
Tone and Volume controls for a wide range of sound. Speaker, earphone jack. Key has adjustable contacts and can be hooked to transmitter. 8½x2¼x3¾ in.

Nearest Dealer/Orders: 800-647-1800
MFJ
MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; **FAX:** (601) 323-6551
TELEX: 53 4590 MFJ STKV
• One year **unconditional** guarantee • 30 day **money back** guarantee (less s/h) on orders from MFJ • Add $5.00 each s/h • **FREE** catalog
MFJ . . . making quality affordable

CIRCLE 86 ON READER SERVICE CARD

Let Everyone Know You're "On-The-Air"

by Paul Danzer N1II

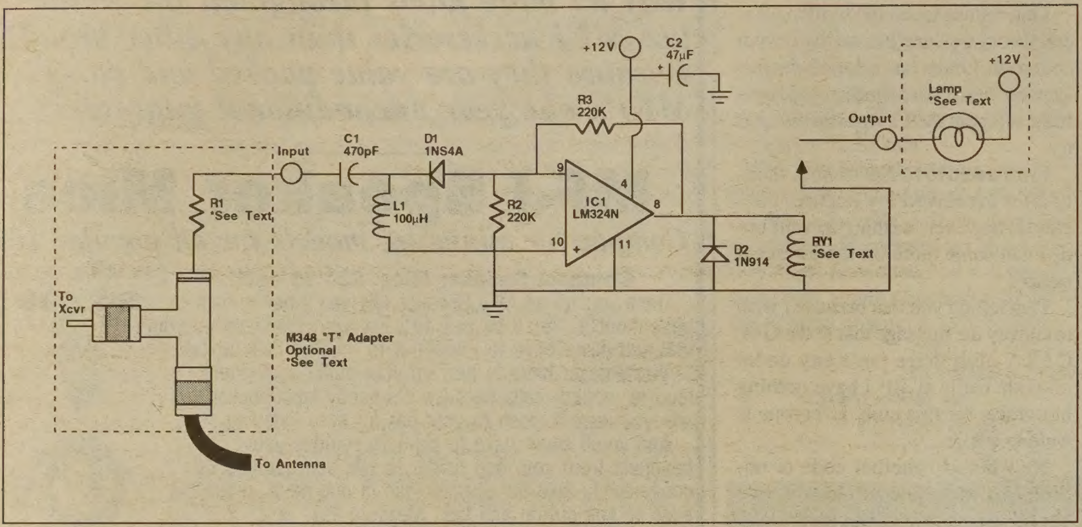


Figure 1. Electrical circuit for the "on-the-air" sign.

How often has it happened to you? You're in the middle of transmitting, push-to-talk pressed on your mike or key down on CW, when someone comes bounding into the room and starts talking to you. When you motion that you are talking the reply is usually, "Sorry, I didn't know you were on the air."

Broadcast stations solved this problem a long time ago. When a studio is in active use there is an illuminated sign at the door, telling potential visitors and passers-by that someone is "on-the-air." Now, for one evening's work, you can build the circuit in Figure 1, put a sign at the door or over the rig, and whenever you are transmitting the sign will light—telling your visitors you, too, are on-the-air.

The Circuit and Parts

The circuit is a broadband detector or RF sniffer—really a crystal set where germanium diode D1 detects a little RF and supplies a DC input to the integrated circuit IC1. This IC is a differential amplifier with very high gain. The Radio Shack part number given in Table 1 is really four amplifiers contained in one package, but at a dollar and change for all four we can afford to ignore the other three.

The amplifier drives a relay, RY1, which has been selected to operate from 12 volts DC at a very small current. Diode D2 protects the circuit from any possible current "kick" which might be caused by the inductance of the relay coil.

The entire circuit is powered from 12 volts DC. No power supply is shown, since most shacks these days have a 12-volt power source. If yours does not, consider adding one—in addition to being very handy for any project you might build, it also gives you the ability to run your mobile rig in the shack.

When the relay is energized it connects one end of a 12-volt automotive bulb to ground. The other lead from the bulb is connected directly to the 12-volt power supply. Any 12-volt bulb may be used as long as it supplies enough illumination and does not require too much current. For the bulb and the socket, you can use those designed to mount as an exterior light on a car or trailer.

The circuit only draws a few milliamperes, but depending on the bulb you select, the bulb could draw one-half ampere or more. Therefore, make sure that your power source is capable of lighting the bulb. The relay in the parts list can handle one ampere on its contacts.

A random sampling at the local automotive supply store provided two good choices of bulbs. Both the bulbs marked 12V 12W (presumable a 12-watt automotive bulb) and the bulb marked 12V 8W (again presumably an 8-watt bulb) provided plenty of illumination for the sign. The 12-watt bulb drew just under one ampere, and the 8-watt bulb just over a half-ampere. Both fit into the standard automotive single contact bayonet socket.

A convenient way to build the circuit is on a breadboard printed circuit board, such as the Radio Shack 276-170. This board has a printed wire bus on both long edges, as shown in Figure 2. One bus, shown here as on the bottom, is used for the minus 12 volt or ground wire. The other bus, shown on the top, is used for plus 12 volts.

Remember that when you look at this board from the top, as shown in the figure, you will not see the buses since they are on the other surface of the board. The layout is from THE TOP OF THE BOARD! This is very important to remember since you will do your soldering on the other side on the board, and everything will be reversed.

The parts list includes a socket for the integrated circuit. This is really not necessary, but if the circuit does not work the first time—and you want to check voltages, connections, or try another integrated circuit—the socket comes

Electrical Parts List

Part	Value	RS#*
R1	See text.	
R2	220k, 1/4W	271-1350
R3	220k, 1/4W	271-1350
C1	470 pF	272-125
C2	47 µF	272-1027
L1	100 µH	273-102
D1	1N34A	276-1123
D2	1N914	276-1122
IC1	LM324N	276-1711
RY1	12V DC, 11 mA coil	275-233
Bulb and socket	Automotive parts, see text.	
PC board		276-170
Optional "T" adapter	M348	278-198
IC socket (see text)	14-pin	276-1999

***Radio Shack part numbers given where applicable.**
Note: An etched and drilled PC board is available for $3 + $1.50 shipping per order from FAR Circuits, 18N640 Field Ct., Dundee IL 60118.

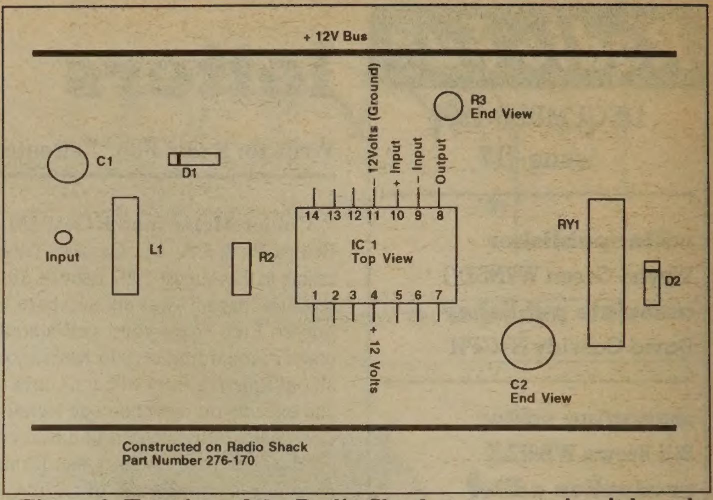


Figure 2. Top view of the Radio Shack prototype circuit board showing component parts placement.

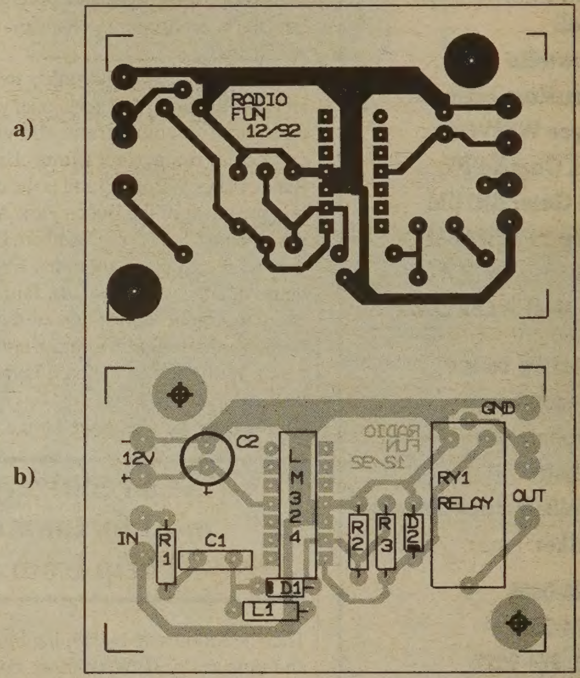


Figure 3. (a). PC board foil pattern (An easier way to wire the circuit up—you can use this instead of the Radio Shack prototype board—see the Parts List for ordering information).
(b). Parts placement diagram for the PC board.

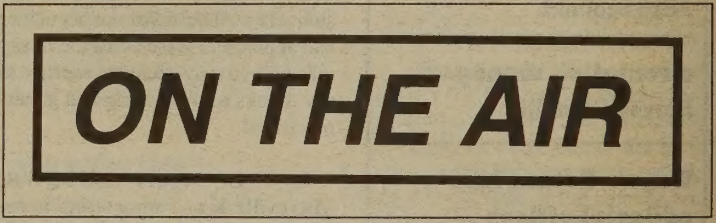


Figure 4. Typical "on-the-air" sign.

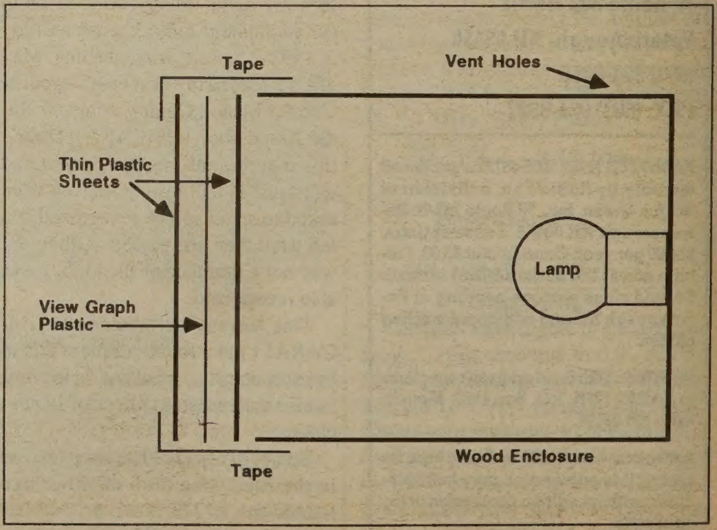


Figure 5. Design for the sign's enclosure.

in very handy. At a current price of two for less than a dollar it pays to use sockets.

A PC Board Alternative

For those of you who would like the ease of using a PC board with traces already layed out for this circuit you can use the pattern shown in Figure 3a or you can order it from FAR Circuits (see the Parts List). When using this PC board, use the parts placement shown in Figure 3b instead of the placement shown in Figure 2.

The Sign and Enclosure

Figure 4 shows a typical sign which was laid out with a simple CAD program and then printed to white paper. The paper was taken to a copy center where it was made into a transparency or view graph on colored-view graph stock. *[Ed Note: A copy center can also expand the sign to fit your enclosure.]*

Any type of enclosure you like can be used for the illuminated sign. Figure 5 shows a small wooden enclosure with an open face. The automotive bulb and socket are mounted in the enclosure and a few holes drilled in the top for ventilation. Finally, the colored "ON-THE-AIR" sign is mounted between two thin pieces of plastic which are taped to close the front of the wooden box. It's not elegant, but it looks pretty and when the light inside comes on every one will know you are transmitting.

For many shacks, a one- or two-foot piece of insulated wire, connected to the input terminal of the circuit shown in Figure 1, will sample enough energy to trigger the circuit. However, if you are running very low power, or have an SWR so good that there is very little RF floating around the shack, you may have to connect the circuit to the rig.

The best way to do this, without affecting the rig, is to use the "T" adapter as shown in the illustration. Take the lead on one end of R1, double it over, and press it into the "T" as shown. Then you can run a foot or two of insulated wire to the input point of the circuit.

R1 provides isolation from the rig, and a resistor of about 100k, 1/4-watt will usually do fine. If you still do not get enough RF you can go as low as a few k ohms without any problem.

The parts list includes Radio Shack part numbers, but feel free to substitute. Except for using a 324-family integrated circuit the values are not critical. Other members of the 324 family have different packages and different pin numbers, so check the unit you plan to use and wire it according to its pinout.

Layout is also not critical, so if you want to wire-wrap or just string it together in the air go ahead—since it is supposed to pick up random RF in the shack you do not have to worry about shielding.

One integrated circuit and one evening's work—and you can tell everyone that you are on-the-air. RF

Amateur Radio News Service Contest

Do you publish a newsletter for your ham radio club? You might want to enter the 1992 ARNS Publication Contest. The Amateur Radio News Service (ARNS) is a worldwide organization founded in 1965 to provide a vehicle for exchange of ideas among amateur radio newsletter editors and public relations directors.

The purpose of the contest is to identify and recognize superior performance in amateur radio journalism . . . and to evaluate club newsletters with suggestions for improvement.

To enter the contest, each club should submit one copy of any issue of their newsletter during the period from July 1991 through December 1992, accompanied by the contest application (available from ARNS), to: Lee Knirko W9MOL, President, ARNS, 11 S. LaSalle St., Suite #2100, Chicago IL 60603.

The deadline for submissions is December 31, 1992. Club newsletters will be judged on general format, overall appearance and content. Certificates of Achievement will be awarded. *TNX W5YI Report, Vol. 14, Issue #21, November 1, 1992.*

ACE COMMUNICATIONS
800 445 7717
317 842 7115
ACE Communications Monitor Division
10707 East 106th Street Fishers, IN 46038

Dial 317 849 8683 to get instant tech information FREE from your Fax!
You can obtain specs and info on these products and more by dialing our Fax Facts automated service. Call our number from your fax, then request the document as listed below. Start your fax and the document will start printing immediately on your fax!

Scanner & Shortwave

AOR AR1000XLT
$429.00
AM Broadcast to Microwave
1000 Channels
500KHz to 1300MHz coverage in a programmable hand held. Ten scan banks, ten search banks. Lockout on search and scan. AM plus narrow and broadcast FM. Priority, hold, delay and selectable search increment of 5 to 995 KHz. Permanent memory. 4 AA ni-cads and wall plus cig charger included along with belt clip, case, ant. & earphone. Size: 6 7/8 x 1 3/4 x 2 1/2. Wt 12 oz. Fax fact document # 205.

AR2500
$429.00
2016 Channels
1 to 1300MHz
Computer Control
62 Scan Banks, 16 Search Banks, 35 Channels per second. Computer control for logging and spectrum display. AM, NFM, WFM, & BFO for CW/SSB. Priority bank, delay/hold and selectable search increments. Permanent memory. DC or AC with adaptors. Mtng Brkt & Antenna included. Size: 2 1/4H x 5 5/8W x 6 1/2D. Wt. 1lb. Fax fact # 305

AR3000
$1095.00
400 Channels
100KHz to 2036MHz
Extreme coverage, excellent sensitivity, plus processor controlled band pass filtering and attenuation to eliminate interference. Top rated receiver in its class, offers AM, NFM Wide FM, LSB, USB, CW modes. RS232 control. Lockout in search. 4 priority channels. Delay & hold & Freescan modes. AC/DC pwr cord and whip ant. included. Size: 3 1/7H x 5 2/5W x 7 7/8D. Wt 2lbs., 10oz. Fax fact document #105.

Free Stuff
Demo disk of SCS (scanner control system) software for AR 3000 & AR2500. Call toll free to order. Also, Free with AR2500: Control software, a $49.95 value. Allocation chart of all voice frequencies. Dial Fax Facts for doc. #999.

Mobile Scanners

Bearcat 760XLTM
$249.95
100 Channel 800 MHz
Five banks of 20 channels each. Covers 29-54, 118-174, 406-512 and 806-954MHz (with cell lock). Features scan, search, delay, priority, memory backup, lockout, service search, & keylock. Includes AC/DC cords, mtng brkt, antenna. Size: 7 3/8 x 6 15/16 x 1 5/8. Wt: 7.5lbs. Fax fact document #550.

Bearcat 590XLTX
$199.95
100 Channel
11 Band
Five banks of 20 channels each. Covers 29-54, 118-174, and 406-512MHz. Features scan, search, delay, priority, memory backup, lockout, service search, & keylock. Includes AC/DC cords, mtng brkt, antenna. Size: 7 3/8 x 6 15/16 x 1 5/8. Wt: 7.5lbs. Fax fact document #570.

Bearcat 560XLTZ
$99.95
16 Channel
10 Band
Compact, digital programmable unit covers 29-54, 136-174, and 406-512MHz. Features scan, WX search, delay, priority, memory backup, lockout, review,& auto delay. Includes AC/DC cords, mtng brkt, antenna. Size: 7 3/8 x 6 15/16 x 1 5/8. Wt: 2.5lbs. Fax fact document #560.

Trident TR-2C
$89.95
Scan/CB with optional radar detector
Scans pre-programmed by state channels in low, high, UHF & T bands. Weather, 40 ch. CB receive plus mobile relay. Size: 7 3/8 x 6 15/16 x 1 5/8. Wt: 2.5lbs. Fax fact document #580.

Mag Mount Antenna. Easy to install whip antenna with 20' of coax & heavy duty magnet BNC MA 100 **$19.95**
Base Antenna. 25 to 1000MHz coverage with 50' of coax. All mounting hardware included. BNC AS 300 **$59.95**
External Speaker. Base or mobile mount. MS190 **$19.50**
Wide Band Pre-Amp. Variable gain up to 20dB covers 100 KHz to 1500MHz. 9Vbatt included. BNC. GW-2 **$89.00**
Interference Filter. Filters and eliminates common causes of interference to scanners. BNC. Model MPIF-1. **$59.00**
Downconverter. Converts 800MHz freqs to 400MHz for 3 band scanners. Quartz locked, 9V batt. DC89. **$89.00**
Extended Warranties & Service. Extended warranties available for most models. Call for quote. Out of warranty service by ex- Bearcat/Regency factory techs. Call for quote.

Hand Held Scanners

AOR 900 $199.95
100 Channel 800 MHz
Five scan banks 5 search banks. Covers 29-54, 118-174, 406-512 and 830-950 MHz (no cell lock). Features scan, search, delay, priority, memory backup, lockout, service search, & keylock. Includes AC/DC cords, mtng brkt, antenna. Size: 7 3/8 x 6 15/16 x 1 5/8. Wt: 7.5lbs. Fax fact document #650.

Bearcat 200XLTN
$239.95 200 Channels 800 MHz
Keyboard Programmable.
Ten scan banks plus search. Covers 29-54, 118-174, 406-512 and 806 956MHz (with cell lock). Features scan, search, delay, 10 priorities, mem backup, lockout, WX search, & keylock. Includes NiCad & Chrgr. Size: 1 3/8 x 2 11/16 x 7 1/2. Wt. 32 oz. Fax Facts # 450

Bearcat 100XLTN Now $159.95
100 Channels, Keyboard Programmable.
Similar to 200XLTN above without 800MHz. Fax facts #460

Bearcat 70XLTP Only $139.95
20 Channels Keyboard Programmable.
10 Band Hand Held with Ni-Cads & Charger. **Fax facts #470**

Bearcat 55XLTR Now $99.95!
10 Channels Keyboard Programmable.
10 Band with LCD. Requires 5AA's . Fax facts #480

Table Top Scanners

Bearcat 855XLTE Now $179.95!
50 Channels Keyboard Programmable with 800MHz. LCD display, lock, priority, Search, WX, Fax facts #655

Bearcat 142XLM Only $87.95
16 Channels with 10 bands. LED display, lockout, priority, WX scan , review key and memory backup. Fax facts #660.

Bearcat 147XLJ Now $93.95
16 Channels with 10 bands. Track tuned, LED display, priority, WX search, review, memory backup. Fax facts #670.

Bearcat 172XLM Only $124.95
16 Channels with 10 bands. Track tuned, LED display, priority, WX search, review, memory backup. Fax facts #680.

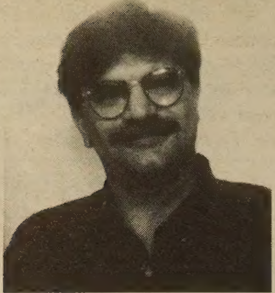
Bearcat 800XLX
$239.95
12 bands and 40 channels with 800MHz and nothing cut out. AC or DC. Fax facts #690.

2 Way Radios

VHF hi band programmable mobiles as low as $299.95. Call for quotes or Fax Fact #755

Call Toll Free, 24 Hours a Day! ***Dial 1-800-445-7717****. Fax Toll Free, 1-800-448-1084*
800 numbers operational in all 50 states, plus Canada. For international voice lines, dial 317-842-7115 or fax 317-849-8794
ACE Communications 10707 East 106th Street, Fishers, IN 46038
VISA
Service & Support hours: Mon. - Fri. 9 A.M. to 6 P.M., Sat. 10-4 EST. MasterCard, Visa, Checks, Approved P.O.'s & C.O.D. (add $5.00) & AMEX (add 5%.) Prices, specifications and availability subject to change. Flat rate shipping & handling charge, $4.95 per unit. Express shipping available , no express C.O.D. One week trial, no returns accepted two weeks after original receipt without substantial restocking charge. All units carry full factory warranty. Indiana residents add sales tax.
MasterCard

CIRCLE 164 ON READER SERVICE CARD



computers in the shack

by Jeffrey Sloman N1EWO

Using a PBBS, Part 2

Last time we looked at reading PBBS messages; this time we'll take a look at sending a message. The network of PBBSs throughout the world automatically forwards messages to literally thousands of Packet Bulletin Boards in the US and all over the world. The commands to send a message to every packet-active ham in your area—or the world—are simple, maybe too simple. Before I show you what to do, I want to talk just a little about what *not* to do.

If you have been reading messages posted on—or forwarded to—your local PBBS, you've undoubtedly noticed the large number of messages addressed to ALL@ALLUS. These messages will be propagated to all the PBBSs in the entire country. You will also have noticed that many of these messages aren't worth the disk space they occupy. These annoying, time-wasting messages are either irrelevant, self-serving, or just plain boring. You don't want your messages to be thought of this way, do you? I didn't think so—here are some ways to avoid that problem.

The first step starts before you even start typing. Think about what you want to say, maybe even make some notes. Whether your message is one asking for help or information, offering something for sale, or answering a message posted by someone else, the time you take to make sure it is worth reading will make the people who read it much happier. Here are a few rules of thumb to help you get started:

•Make it interesting—something *you* would want to read.

•Make it clear—the content of the message should make sense.

•Make it concise—avoid repeating yourself and keep it as short as you can.

•Make it informal and personal, like a conversation with a friend—this isn't an academic dissertation.

Now you can write your message, preferably off-line. If you know how to use your communications program to upload a text file, great—compose your message in a text editor, get it just the way you want it and then upload the message. If not, don't worry—just write it down or use a word processor and print it out. You will be amazed at how much better your messages sound when you don't write them on-line (while connected), and best of all you'll build a reputation for being a thoughtful, well-spoken person.

The next step is choosing where to send your message. Now, I won't say that there is *never* a reason to send a message to ALL@ALLUS—but there is very rarely a reason to do it. When you choose where to send a message, think about what that message is supposed to accomplish. For example: If you are selling a 70-foot tower—and you live in Orange, New Jersey—you aren't likely to get a buyer from San Ysidro, California. Why would anyone send a message advertising a 70-foot tower to ALL@ALLUS? Your guess is as good as mine, but it has been done. What should you do instead? Well, I would guess that all of New Jersey would be fair game, so send why not send it to SALE@ALLNJ? This routes the message to all PBBSs in Jersey, and the "SALE" address clues people into the content of the message. It saves precious space in the title, too.

Now that you know what you are going to send, and where you will send it—you need to decide what to call it. The title you put on your message is what will make people read or ignore it. You've only got 31 characters to get people interested; you must use them carefully. Reading your title must make the content of the message as clear as possible—or at least as interesting—like a newspaper headline. A quick survey of the messages on the average PBBS will turn up message titles like "HELP"—addressed to ALL@ALLUS—and "need hardware and software for"—addressed to HELP@ALLUS. You can see where titles like this aren't going to get you too far. To choose a title, think about what your message is about, and say so. It's that simple—just remember you only have about 30 characters to do it in. For example, if you live in Indiana and write a message asking for help getting started in AMTOR, you might send it to AMTOR@ALLIN with the title: "Please help me get started." This is a very clear request for help getting started in AMTOR. Notice that it is *not* sent to ALLUS. Instead, it is sent more locally—ALLIN, in this case. You are very likely to get some help in almost any ham radio related area within your own state, but if you don't, *then* you can try a bigger coverage. Start small, then get bigger until it works.

So we've got a message, an address, and a title—we're ready to send it out into the world. The commands to do this are simple, and work pretty much like the others we looked at last time. The basic command to send a message is, no surprise, SEND—the abbreviation used is "S." The letter "S" alone, though, means something different: STATUS. While this doesn't do any damage, and provides some interesting information (try it), it won't send a message. The SEND command is an "S" followed by an additional letter and/or a destination.

S
STATUS

This command displays status information about the PBBS ports, activity, and messages to be forwarded.

SB GROUP@ADDRESS
SEND BULLETIN

This command sends a BULLETIN, a message to be read by a large group of hams. The GROUP is any useful name up to six characters long—the size of the longest legitimate ham call. Common GROUP names are HELP, YAESU, ICOM, AMTOR, and other obviously descriptive names. The ADDRESS portion determines where the bulletin will go. There are many regional names—ALLIN, for example, will send a bulletin to all of Indiana. You can put any state abbreviation in place of IN. You will see many regional addresses if you monitor the traffic on your local PBBS.

SP CALL@PBBS
SEND PERSONAL

This command sends a PERSONAL message to another ham. Only the addressee and the PBBS's sysop may read it. CALL is the call of the ham to whom you are writing. PBBS is the home PBBS of that ham.

SR
SEND REPLY

This command sends a reply to the message you have just read.

As you can see from the descriptions, these commands are very simple. But just to be sure that you have a good grasp of how this works, take a look at an example session, shown in Figure 1.

Figure 1 is a PBBS session sending a bulletin requesting comments on handheld cellular phones, sent to all PBBSs in Indiana. You can see that it starts with an SB command—right after the first prompt—to a group called "cell," which I made up on the spot as an easy way for hams with a possible interest to identify this message as a candidate to read. It is addressed to "allin," because I figured that there should be enough experience among Indiana hams to get a good response. If this turns out to be less than satisfactory, I can resend it to a wider area. Next, the PBBS prompts for a subject (title). The title, "Do you own a handheld cellular?" fits in the allowed space and gets the point across. If I saw the message title, I would be interested in reading it. The next prompt asks for the message, tells how to end it, and lets you know what the message number will be. Notice that the body of the message is short and to the point. It says what I want without excess words. This message is particularly terse, as an example. Notice that just after the closing is ^Z (control+Z) which lets the PBBS know that you are through entering text. The PBBS responds with another prompt after it has recorded the message. That's it; the message is on its way.

As you can see from this example, sending messages is easy and, with a little work on the front end, you can write messages people look forward to reading. I look forward to reading messages from you on the packet network!

Once again I want to thank you for writing. Keep those cards and letters coming. 73 de N1EWO.

```
N1EWO de N5AAA: at 0359z on 921012
>
B,D,H,?,I,J,K,L,N,R,S,T,U,V,W ??
sb cell@allin
Enter Subject of Message:
Do you own a hand-held cellular?
Enter message, ^Z (CTL-Z) to end, it will be message 7708
I just purchased an AT&T 3710 handheld (actually made by OKI) and
am curious about anyone's experience with this or any other
handheld phone. Which handheld do you have and how do you like it?
73 de N1EWO—Jeff
^Z
N1EWO de N5AAA: at 0406z on 921012 B,D,H,?,I,J,K,L,N,R,S,T,U,V,W ??
>
```

Figure 1. A sample session, sending a bulletin.

WB8VGE
FROM WIND AND SUN
QRP Solar Power
Mike Bryce, 2225 Mayflower NW, Massillon, Ohio 44647

radio magic

by Michael Bryce WB8VGE

More Ways Around Antenna Restrictions

With the increasing number of condominiums, urban apartments and suburban neighborhoods with restrictive real estate covenants it may appear that there is no hope for the would-be ham operator.

Last month I gave you some ideas on installing small invisible antennas. Sometimes, no matter how carefully you plan to install this type of antenna, you'll still not be able to have one up in your restrictive home lot. So what's left for you to do? Well, there is still hope! You can still get on the air even if you're not allowed one single wire hanging from your house.

An Inside Dipole

If you recall, last month I mentioned that you can install a dipole or even a small triband beam up in the attic, assuming you have access to the attic. If you don't have access, and you can't run cables up to the attic, then why not try an inside dipole taped to the inside corners of a room? Now, don't laugh; they really do work.

A good 10 years ago a friend of mine, Glen, would come to the local radio club meeting and show off the QSL cards he just received in the mail. Of course that's nothing unusual, but in Glen's case it was! For Glen worked only QRP (power under 5 watts output) and for an antenna he used a 20 meter dipole stretched out in one corner of his bedroom. He used a small home-brew antenna tuner to match the output of his Heathkit HW-8 to the dipole. The antenna consisted of nothing more than the required length of #22 gauge magnet wire and some RG-58/U cable. Glen tuned the antenna by watching a field-strength meter on the table, simply tuning for maximum radiation from the dipole. Glen worked over 200 countries with this inside dipole before moving into a house in which he could install an outside antenna.

It's easy to install a dipole like the one Glen had. You'll need some magnet wire or some other type of thin gauge wire and a short piece of RG-8/U coax cable. Don't use the larger RG-8/U as it is too large and heavy, and will pull down the wire you're trying to keep up. Remember, you'll have to hold the dipole up without the benefit of poles or trees. In the case of the inside dipole, it'll more likely be sticky tape and thumbtacks holding up the ends of your dipole!

In fact, you can use a short length of 300-ohm TV lead-in wire to feed the dipole. If you do, you'll need an antenna tuner that will accept open line feed. Most antenna tuners have this feature built in. A 20 meter inside dipole will do a very good job working the world with 100 watts of RF.

Cut the wires to the required length (using the formula in last month's column), and then use thumbtacks, pushpins, or even double-sided tape to secure the wires to the upper inside corners of a room. If you're renting, be careful about using double-sided tape. That stuff is really nasty to remove without taking the dry wall with it.

Feed your antenna in the middle, at the corner. The corner will provide a good place to secure the feedline, be it coax or twin lead. Run the feedline to the antenna tuner and you're ready to go on the air.

By placing some traps in the antenna, you'll be able to get on more than one band. Most traps are kinda heavy and you'll need to come up with some type of method to keep them up. If you have the space, then you can make the dipole a bit longer to cover more than one band. You'll need to make the wires at least a quarter-wavelength long for the lowest frequency you'll want to use. Most apartments don't have the room for an 80 meter dipole, but you should have no trouble installing at least a 40 and 30 meter version.

By feeding your antenna with open line (TV lead-in works great) and using an antenna tuner, you'll be able to get out on several different bands.

Always place your inside antennas up as high as possible. Not only will this improve the antenna's performance, but you'll have a safer installation, too. You can get a nasty RF burn with even 100 watts of power.

A Modified Mobile Antenna

OK, but what about places where you aren't allowed any wires inside the apartment, what then? Well, you can use an entirely different approach. You can use a regular mobile antenna with some modifications.

First, you'll need the antenna. I found that the Hustler mobile resonators work the best for me. Other companies also make mobile resonators. Check the ads here in *Radio Fun* for them. You need a mast to mount the resonator to. Hustler provides several different types. You'll also need some method of holding the resonator and the mast. And, you will need some method of securing the antenna and its holder to a window frame.

I'm not sure, but I think Hustler makes a vice-grip type device to hold their antennas. If not, they're not hard to make. A trip to a hardware store and the local Radio Shack will be required to get everything you need.

To use your antenna system, open up a window and clamp the antenna to the window frame. If you have an aluminum window frame, so much the better. If not, then you might need to run a counterpoise wire from the base of the clamp. Just run this wire along the floor. This counterpoise wire will give the mobile antenna something to work against.

Here again, you'll more than likely need an antenna tuner. Don't be surprised to see a very high SWR on this setup. If you can get some better grounding to the antenna base, the better the setup will work for you.

After you're done, simply unclamp the antenna and store it out of sight.

The Hustler antennas (resonators) will only cover one band at one time so you'll need to buy a resonator for each band you plan on working. As you go lower in frequency, you'll get less and less bandwidth from the resonators.

There's another way of working with the mobile resonators. They work great on a mobile! If you can park your automobile near your home or apartment, then just tap into the mobile antenna on your car. All you have to do is run a short length of coax from your car to the rig in your house. It's simple to do but it does have two drawbacks. First, you have to roll out the coax and then roll it back up when you're done. And second, you'll have to go outside to change the resonators when changing bands. There are adapter plates made to hold three or four resonators at a time, so it would be a good idea to check them out.

Getting on VHF and UHF Frequencies

As you can see, there are many ideas when it comes to getting on the HF bands while living in an antenna-restricted location. Well then, how about the VHF and UHF frequencies? They're a lot easier to get running than the HF frequencies (3-30 MHz) because the antennas are physically smaller. You have to pay more attention to the smaller details as you can't readily tune out the SWR as easily as you can on the HF frequencies. Yes, there are antenna tuners made for the VHF frequencies, but they're hard to come by and costly.

One of the all-time classic 2 meter antennas is the coat hanger ground plane. Made up of four 19-inch pieces of coat hanger and a SO-239 connector, it's a hard act to follow for the outlay of money. Hang it up in a closet or in the attic and you'll be surprised by its performance.

A small magnet-mount mobile antenna stuck to the top of a file cabinet or the top of the refrigerator works great, too. All that metal makes a very good ground to work against. Even placing an HT on the top of a file cabinet and using a speaker mike works wonders when compared to just the small antenna on the radio.

All of these ideas work well on any of the popular VHF and UHF frequencies. The biggest thing to worry about when working with these frequencies is the loss in long runs of coax. Even the best RG-8/U is lossy when working 450 MHz.

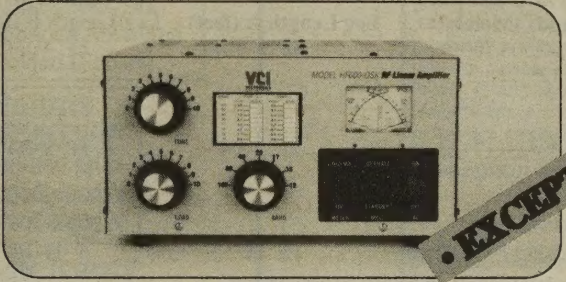
One thing to remember when working the world using a less-than-perfect antenna: You're not going to be king of the hill and run the bands with the big guns. You'll make plenty of contacts and lots of DX QSL cards will be in the mail, but don't expect the same results as the station running a kW with a full-size 20 meter beam.

Well, that's about all the space we have this month. It's hard to believe, but another year has come and gone.

If there is something you would like to see in this column, please feel free to drop me a note. In the coming months, I'll cover some simple construction projects—nothing fancy, but they will come in very handy in everyone's shack. Have a joyous holiday season. RF

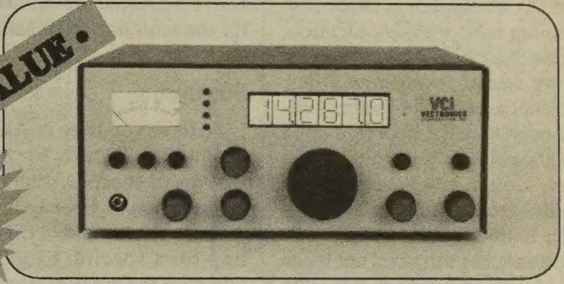
QUALITY, FACTORY DIRECT

BUY VALUE PRICED, INNOVATIVE HIGH TECHNOLOGY



VCI • EXCEPTIONAL VALUE •

NEW

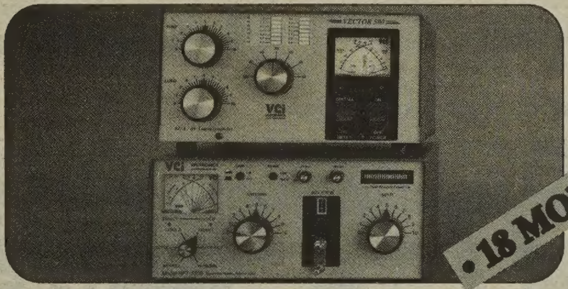


HF600-QSK LINEAR AMPLIFIER

Tabletop Amplifier with WARC bands & optional QSK, 850 W most bands, 1,250 W PEP output. Price .... ~~$1,399~~, NOW $1,350 delivered in U.S.

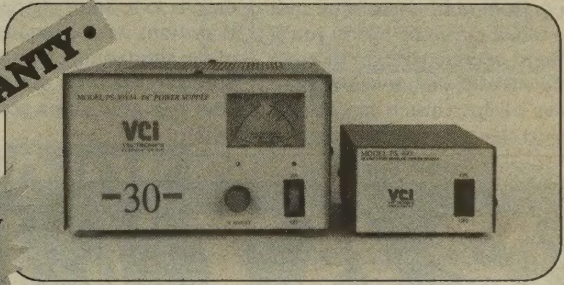
TR-50 Watt compact TRANSCEIVER

CW/SSB, compact, 3 Band, 8 pole filter. AC/DC input voltage. 50 Watts CW/SSB. Price ..(pick any 3 bands, 1.8-30 MHz).... $699



VCI • 18 MONTH WARRANTY •

NEW

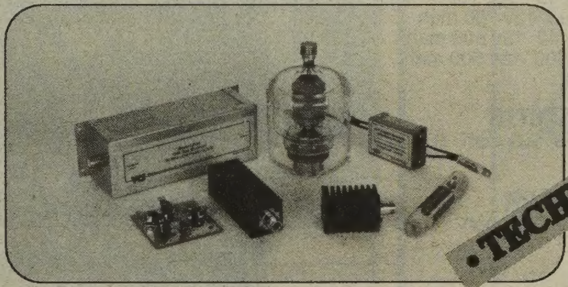


VECTOR 500 AMP, HFT-1500 TUNER

A great combination, 4 x 811A Linear with a 1.5 kW Antenna Tuner & new heavy duty Roller Inductor. Vector 500 .... $899 HFT-1500 .... $399

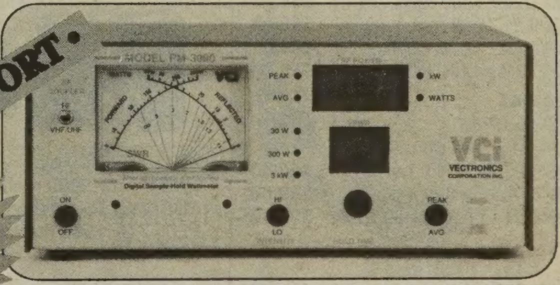
SWITCHING POWER SUPPLY

Compact, 30 Amps. PS400........$225
LINEAR SUPPLIES, 21 A. cont. 30 max
PS-30VM metered..$199, PS30F....$179



VCI • TECHNICAL SUPPORT •

NEW

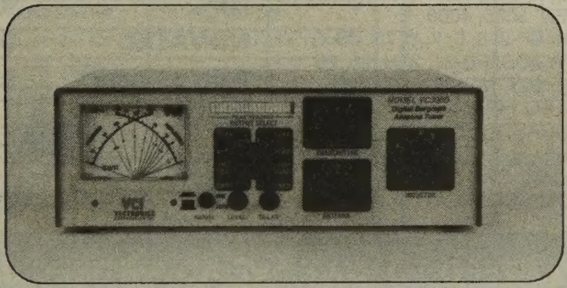


FILTERS AND DUMMY LOADS

A wide range of HP, LP Filters & Dummy Loads from 40 to 2,500W.

PM-3000 True PEP WATTMETER

Microprocessor based Analog & Digital displays with variable hold times. Price: .... $399.



300 WATT ANTENNA TUNERS

VC-300 Basic Tuner ,..~~$129~~..NOW......$119
VC-300DLP With D.L. ~~$149~~, NOW $139
VC-300D With Dummy Load &
Digital Bargraph........... ~~$185~~,.NOW......$175

Vectronics Corp. Inc.

31 Estate Drive, Scarborough, Ont. Canada M1H 2Z2
Phone: (416) 289-4637 FAX: (416) 289-4638

ORDER FACTORY DIRECT
SHIPPING IS FREE IN USA

VISA

Call us Toll Free:
1 (800) 267-5354

ASK FOR FREE CATALOG

CIRCLE 70 ON READER SERVICE CARD

Trap Dipoles

Continued from page 4

amount of wire to lower the resonant frequency.

Once you get the antenna (from the feed point out to the traps) resonant on (here) 40 meters at or near the desired frequency, add lengths B to each leg and test the entire antenna for lowest SWR on 80 meters (3.75 MHz). You'll note little change if any to your 40 meter SWR low point (recall that the traps being resonant at 7.2 MHz offers a high impedance to a 7.2 MHz signal . . .).

Do all of this trimming either with the antenna in its ultimate location, or at least in a clear space away from detuning agents (buildings, trees, metal fences, etc.) and for best all-around operation, the final feed point height should be as high as you can manage. Unless you achieve a half wave on a band, you won't experience the textbook figure-eight radiation pattern, but this does not mean you won't be able to operate with the feed point not quite so high. It just means, among other things, that your radiation pattern will be more omnidirectional.

Experiment with tuning straight through from radio to antenna and/or via tuner. On some bands you'll be able to operate straight through with low SWR; others will require the tuner's help to match impedances. I suggest that you use the tuner all the time, however; although you induce a minor signal loss this way, you do also "clean up" spurious harmonics to some extent, resulting in a cleaner, sharper audio, and less TVI/RFI problems.

Impedance

Using the data in Table 1, the trap dipole radiation resistance can be as high as 100 ohms and as low as 25 ohms, depending on the antenna feed point height at your particular QTH, which represents an SWR range of 2:1 to 1:1. The tuners in modern radios can easily handle SWR mismatches up to 3:1. Because of this, I have found the use of 50-ohm coax for the feed line to be satisfactory.

Summary

So there you have it. Although the example given was for 80-10 meters, the methodology applies to other band ranges in exactly the same manner. You make a dipole and a trap for a specific band, then you add wire for the next band lower in frequency. On the higher band the trap "cuts off" the outer wire. On the lower band the signal doesn't "see" the trap. You're back to a dipole for that band. That's really about all there is to it. Some shortening of the B sections will be required because of the shortening effect thereon induced by the traps, but the Table 1 data will give you a good starting point.

So now you're saying "Phooey . . . I can buy one of these things for peanuts . . . so why go to all this trouble?" Sure, you can purchase one "off the rack" and it will most likely work from the moment you hook up your feed line. But doing this, you won't be able to say "Antenna is home-brew." You will have missed half the fun of being a ham . . . building parts of your communication system yourself, and making them work, and thereby learning how they work. And it's no trouble . . . building is fun. Happy trap dipole building! RF

Band and Fractional Wavelengths

Band (Meters)	Fraction of Waves
80	Quarter
40	Half
30	3/4
20	One
17	1-1/4
15	1-1/2
12	1-3/4
10	Two

Notice that to get 80, we design for a half wave on 40, which results in a quarter wave on 80, so we will have multiples of the lowest frequency quarter wave to accommodate all the other bands, in steps of a quarter wave of the lowest frequency (80), as this is how the HF bands are related.

Table 1

Bands (Meters)	Leg Length A (feet)	Leg Length B (feet)	Trap Data: Coil	Trap Data: Capacitor
80,40,30*,20,17*, 15,12*,10	32' 6"	23' 4-1/4"	10 turns 2-1/2" PVC 2-1/8" long	100 pF 5000 VDC Transmitting mica
40,30*,20,17*,15,12*,10	16' 5-3/4"	11' 5-3/4"	7 turns 2-1/2" PVC 2" long	50 pF 5000 VDC Transmitting mica
30,20*,17,15*,12,10	12' 11"	6' 11-1/4"	5 turns 2-1/2" PVC 1-1/2" long	50 pF 5000VDC Transmitting mica
20,17*,15,12*,10	11' 1/4"	2' 9-7/8"	4 turns 2-1/2" PVC 1-1/8" long	50 pF 5000VDC Transmitting mica
17,15*,12,10*	9' 4-9/16"	1' 5-1/4"	4 turns 2" PVC 1-1/8" long	50 pF 5000 VDC Transmitting mica

*May require use of A.T.U. (tuner)

BATTERIES

REPLACEMENT
BATTERIES
(ALL NEW—MADE IN USA)

ICOM

7S 13.2v 1200 mah	$54.00
8S 9.6v 1200 mah	$52.00
BP7 13.2v 600 mah	$59.00
BP8 8.4v 1200 mah	$59.00
SA/SAT	
BP82, BP83	
BP83A 7.2v 750 mah	
BP84 7.2v 1000 mah 3"	$40.00
BP85A 9.6v 600 mah 3"	$69.00
BP85B 12v **600** mah 3"	$69.00

KENWOOD

PB1 12v 1000 mah	$59.00
KNB4 7.2v 2200 mah	$59.00
PB6 7.2v 750 mah	$46.00
PB7 7.2v 1500 mah	$55.00
PB8 12v 800 mah	$49.00

MOTOROLA

HT300 7.2v 1600 mah	$45.00
HT90 12v 600 mah	$34.00
HT440 12v 600 mah	$39.00
MT500 15v 500 mah	$39.00

RADIUS

P-10 500 mah	$28.00

SABER

7.2v 1100 mah	$59.00

SPECIALS
10%Off
All
KENWOOD
Battery Packs

NEW

ALINCO

16N 7.2V 750 mah	$35.00
18N 12V 600 mah	$45.00

YAESU

FNB 25 7.2V 600 mah
FNB 26 7.2V 1000 mah
FNB 26A 9.6V 800 mah
FNB 27 12V 600 mah
FNB 27S 12V 800 mah

YAESU

FNB-2 v 500 mah	
FNB-2 v 600 mah	
FNB-4A 12V 1000mah	$55.00
FNB-17 7.2V 600mah	$30.00
FNB-10S 7.2v 1000 mah	$42.00
FNB-12S 12v 600 mah	$45.00
290 charger (For FNB 17,10S, 12S)	$65.00

Now Available:
ALINCO 580

EBP-20N	7.2V	800 mah
EBP-20NX	7.2V	1200 mah
EBP-22N	12V	800 mah

EDC-34 RAPID CHARGER $81.00

INSERTS

CALL FOR LOWEST PRICES

ALINCO 10N, 12N
AZDEN 3000, 4000
ICOM BP-2, 3, 5, 7, 8, 7S, 8S
KENWOOD PB-21, 21H, 25, 26
REGENCY MT1000, HX1200
SANTEC 142, 144
STANDARD BP-1
TEMPO S-1, 2, 4, 5, BP-15, S-15
TEN TEC 2991, 2591
UNIDEN (BEARCAT)

CELLULAR

MITSUBISHI	**$50.00**
NEC	**$45.00**
NOVATEL	**$45.00**
PANASONIC Bag Phone Kits	**$45.00**

MOTOROLA "FLIP" $60.00

CAMCORDER

JVC

PANASONIC

PVBP80/88 12v 2.3 amps*	$36.00

RCA/HITACHI

Full size
VHS-C

SONY

NP22	
NP55/77 2400 mah	$39.00

ALL BRANDS AVAILABLE

*original Panasonic

*ALL BATTERY PACKS—GUARANTEED TO HAVE THE ADVERTISED CAPACITY

SEND FOR FREE CATALOG

DEALER INQUIRIES WELCOME

BATTERY-TECH, INC.

28-25 215 PLACE, BAYSIDE, N.Y. 11360 FAX 718–461–1978

800–442–4275 — N.Y.S. 718–631–4275

VISA MASTER CARD DISCOVER

CIRCLE 105 ON READER SERVICE CARD

UNADILLA ANTENNA MANUFACTURING CO.

PO Box 4215 BV•Andover•MA•01810

(508)
474-8949
24 Hour FAX

(508)
475-7831
9-5 EST M-F

THE BIG™ SIGNAL

Amateur Antenna Baluns

W2AU
(1:1 & 4:1)

For over 20 years, preferred by Amateur, Military and Commercial Operators. Assembled with all stainless steel hardware and a built-in lightning arrester minimizes your TVI, maximizes your power.

W2DU
(HF&VHF)

Transformer Baluns

For medium power (1000 watts RF minimum) and broadband operation 3-40 MHz.

W2AU 1:1	W2AU 4:1
50/50 or 75/75Ω	200/50 or 300/75Ω
Dipoles,V's	Hi-Impedance Antennas
Beam Models, Quads	(ie:Folded Dipoles)

Non-Transformer Baluns

W2DU-HF		W2DU-VHF
1.8-30 MHz		30-300 MHz
3000-9000W	w/1:1 SWR	2000-4000W
1500-5000W	w/2:1 SWR	1200-2400W

Contact Your Local Ham Dealer Today!!!

To order direct call (508) 475-7831or write
for our informational brochure on our other fine products

Baluns•Antenna Kits•Filters•Center Insulators•ENDsulators™•Coaxial Relays
All products come with a 30 Day Warranty

-NOTICE-

We are the NEW manufacturers of the original
JAMES MILLEN™ Products
(508) 975-2711 9am-5pm EST M-F

CIRCLE 136 ON READER SERVICE CARD

SPY ON THE EARTH

See *live* on your PC what satellites in orbit see

Learn how you can benefit greatly from this exciting new technology. Send $25 ($30 air, $35 overseas) for our *fantastic* 12 diskette set of professional quality copyrighted programs (IBM type) that does satellite tracking, data acquisition, image processing, file conversion and much more. Diskette package includes all programs, satellite views, C language source code for a popular satellite image acquisition program, hardware schematics, catalog and $25 discount certificate.

Reception guaranteed Worldwide
Absolutely legal
No satellite dish needed

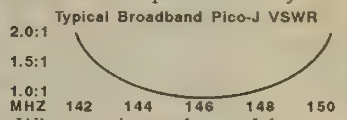
For FREE information log on to our bulletin board with your MODEM at (718) 740-3911 or call (718) 468-2720, to place an order. Buy with confidence. We've been in business since 1956.

VANGUARD Electronic Labs
Dept. RF, 196-23 Jamaica Ave.
Hollis, NY 11423

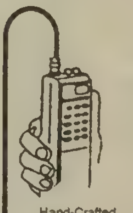
PicoJ™

Pico-J rolls up and hides in his 4-ounce pocket-sized holder, waiting like the Genie in a bottle till you need full-quieting signal punch.

Call him forth and his glistening black weather-sealed lines reveal a sleek tough end-fed halfwave antenna ready to hang anywhere. Attach **Pico-J** to window glass or curtain rod. Suspend in the apartment closet or patio doorway.



When you're on the road, hang **Pico-J** in the motel window or from a light fixture.



Hand-Crafted in the U.S.A.

Carry **Pico-J** with you for emergencies. His extra reach can save life.

Pico-J needs no radials for broadband low-angle omni-directional halfwave gain. He improves received signals, stretches simplex range, reaches far away repeaters, saves your battery pack.

Pico-J comes ready for work with 72" isolated coaxial feedline and gold pin BNC.

Models
2 meters
220 MHz
440 MHz

AntennasWest
Order Hotline
800-926-7373

19.95 ppd

CIRCLE 90 ON READER SERVICE CARD

---

1 - 800 - 4 - A - HAM - TV

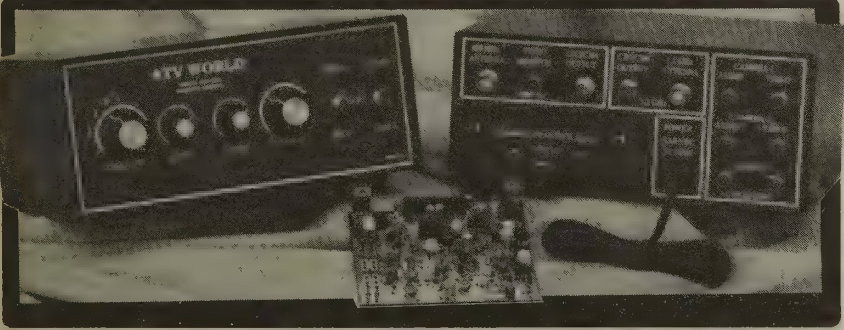
1-800-424-2688 (ORDER LINE ONLY PLEASE)

ATV TRANSCEIVER ATV-5TR

SINGLE BAND TRANSCEIVER —— $399.95
Assembled, Tested, and Ready to Operate !

10 WATT P/P RF OUTPUT !

DUAL BAND RX TRANSCEIVER —— $489.95
Choice of Red or Gray Front and Rear Panel !



RX-4-U	69.95	450 MHZ CONVERTER, RELAY, VIDEO MONI, CH. 3/4 OUT	UNASSEMBLED
RX-4-AT	89.95	450 MHZ CONVERTER, RELAY, VIDEO MONI, CH. 3/4 OUT	ASSEMBLED AND TESTED
RX-9-U	69.95	900 MHZ DOWNCONVERTER CH. 7/8 RF OUTPUT	UNASSEMBLED
RX-9-AT	89.95	900 MHZ DOWNCONVERTER CH. 7/8 RF OUTPUT	ASSEMBLED AND TESTED
RX-1-U	69.95	1200 MHZ DOWNCONVERTER TO CH. 7/8 RF OUTPUT	UNASSEMBLED
RX-1-AT	89.95	1200 MHZ DOWNCONVERTER TO CH. 7/8 RF OUTPUT	ASSEMBLED AND TESTED
RXO-X-U	29.95	CRYSTAL CONTROL OPTION FOR 1200,900,400 Mhz RX's	UNASSEMBLED
RXO-X-A	39.95	CRYSTAL CONTROL OPTION FOR 1200,900,400 Mhz RX's	ASSEMBLED AND TESTED
TX-4-U	159.95	4 CH. 10 W. CRYSTAL CONTROL TX WITH ONE FREQ.	UNASSEMBLED
TX-4-AT	189.95	4 CH. 10 W. CRYSTAL CONTROL TX WITH ONE FREQ.	ASSEMBLED AND TESTED
CB-B	39.95	CABINET - PUNCHED, DRILLED, PAINTED RED OR GRAY	NO HARDWARE
CB-HP	24.95	CABINET HARDWARE PACKAGE - SWITCHES, POTS, ETC.	BAG OF PARTS
CB-U	64.95	CB-B AND CB-HP COMBINATION	PARTS UNMOUNTED
CB-M	79.95	CB-B AND CB-HP COMBINATION	PARTS MOUNTED IN PLACE
WH-1	24.95	PRE-ASSEMBLED COMPLETE WIRE HARNESS	YOU INSTALL
FR-XXX	14.95	XXX= 421.25, 426.25, 427.25, 434.00, 439.25	STANDARD FREQ'S

ATV WORLD
PHOENIX ARIZONA
A STEP ABOVE DEAD AIR

TECHNICAL LINE
(602) 978-4348
ORDER LINE
(800) 4 A HAM TV
(800) 424-2688

3713 W. CHARLESTON AVE GLENDALE, ARIZONA 85308

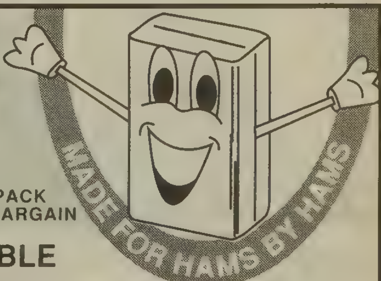
CIRCLE 17 ON READER SERVICE CARD

EXERCISE

Does Your Heart Good.

American Heart Association

PERIPHEX POWER PACKS FOR
LONGER
QSO TIME


MADE FOR HAMS BY HAMS

REMEMBER... A LOW COST POWER PACK WITHOUT PERIPHEX'S QUALITY IS NO BARGAIN

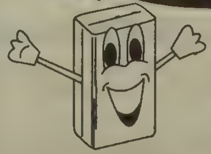
NEW MODELS NOW AVAILABLE

ICOM	YAESU	KENWOOD
BP-83S 7.2V 750mah **$43.50**	FNB-2 10.8V 500mah **$22.50**	PB-13S 7.2V 1200mah **$49.75**
BP-84 7.2V 1000mah **$57.00**	FNB-12 12V 500mah **$45.95**	PB-14S 12V 400mah **$60.00**
BP-84S 7.2V 1400mah **$63.00**	FNB-14S 7.2V 1400mah **$59.75**	
BP-85S 12V 800mah **$76.00**	FNB-26 7.2V 1000mah **$60.00**	
BP-114S 12V 800mah **$79.00**	FNB-27S 12V 800mah **$65.00**	

ASK FOR OUR CATALOG

Manufactured in the U.S.A. with matched cells, these Super Packs feature short circuit and overcharge protection, and a 12 month warranty. All inserts and packs in stock or available from authorized dealers. **CALL US TO DISCUSS YOUR BATTERY REQUIREMENTS.**

CALL FOR OUR SPECIAL OFFEERS



Add $4.00 Shipping & Handling for first battery,
$1.00 for each add'l battery - U.S. only.
Connecticut residents add 6% tax

VISA

PERIPHEX inc.
115-1B Hurley Road, Oxford, CT 06478
800•634•8132
Connecticut 203•264•3985 – FAX 203•262•6943

CIRCLE 68 ON READER SERVICE CARD

BATTERIES

Nickel-Cadmium, Alkaline, Lithium, Sealed Lead Acid For Radios, Computers, Etc. And All Portable Equipment

YOU NEED BATTERIES?
WE'VE GOT BATTERIES!
CALL US FOR FREE CATALOG

MR. NICAD

E.H.YOST & CO.
7344 TETIVA RD.
SAUK CITY, WI 53583
(608) 643-3194
FAX 608-643-4439

CIRCLE 114 ON READER SERVICE CARD

AEA
ASTRON
BENCHER
BUTTERNUT
CALLBOOK
COMET
DIAMOND
HUSTLER
KANTRONICS
LARSEN
ANTENNA
MFJ
RADIO SHACK
SMILEY
ANTENNAS
VALOR
ANTENNAS
& more.

Small town service with discount prices.

DANDYS

120 N. Washington
Wellington, KS 67152
(316) 326-6314

CIRCLE 130 ON READER SERVICE CARD

RF vintage review

The Kenwood TR-7400A 2m transceiver.

Kenwood TR-7400A 2m Transceive

by Warren Elly WA1GUD

The Kenwood TR-7400A covers the entire 2m band and offers one of the most flexible squelch systems going—continuous tone-coded squelch (encode and decode or encode only with common frequency active filters), tone burst, and normal carrier squelch. The TR-7400A is delivered set up for normal carrier operation, with a series of optional modules available for the other squelch modes. A front panel selector switch allows for all three variations, with an LED indicator to remind you when the TR-7400A is in the continuous (encode and decode) tone-coded mode. Kenwood has tried to eliminate the characteristic time lag in tone squelch circuits through the use of an active filter. Other squelch modes selected from the same control include tone burst and subaudible (encode only) tone. In all, Kenwood offers 25 different modules covering the tone squelch and tone burst modes. Only one frequency of each type can be used at a time, but the use of computer type connectors would allow easy modification for outboard selection of several different frequencies.

The TR-7400A offers you a lot for your money. Aside from the unique squelch design and full coverage synthesizer, Kenwood decided to go beyond the normal 10-watt output of most transceivers. Despite published specifications of 25 watts out, the TR-7400A delivered more than 30 watts into a 5/8-wave antenna, and the low power position yielded 5 watts out. I was easily able to adjust low power up to 10 watts and drive my 10-by-70-watt amplifier (a necessity in the low lands up here). In most cases, I found the 25-watt position more than adequate to access repeaters I couldn't use with 10-watt rigs, but it was real nice to have three levels of power to choose from. Kenwood uses the Motorola MRF-208 as a driver, and the 2N6083 for the final, which may explain the massive Motorola-like heat sink. The finals are protected by *reducing* output when faced with impedance mismatches, instead of shutting down the radio completely. The front panel meter reads output, so just operating the Kenwood will tell you something about your antenna system. According to the manual, a reading of "8" in the high power mode on a scale of 10 indicates an SWR of less than 1.5:1. Low power, factory-adjusted for 5 watts, reads a "3" on the meter scale. Tests with antennas purposely put out of tune reduced high power output to as low as "5" on the meter without excessive heat or transmitter shutdown.

Audio reports were good, with many stations responding that the Kenwood's talk power exceeded everything else on frequency. A deviation meter showed plenty of audio to spare; the 5 kHz spec proved to be quite conservative for my voice characteristics, and the mike gain had to be adjusted. Quality-wise, the Kenwood's audio drew compliments, although several other TR-7400A users objected to the factory-supplied dynamic microphone, claiming it was too small for comfortable operation. It took a bit of getting used to, but the palm-size mike actually became preferable after a period of time. (Other large microphones were tried, but reports did not indicate any change in the audio level or quality.) Hooking up a touch-tone pad couldn't be easier, since Kenwood included side panel jacks (mini type) for pad input and external speaker output, thus eliminating the need for hard-to-connect octal type sockets. (Ever tried to put your radio in the car at night and line up those darn pins without bending them?)

The TR-7400A synthesizer is the phase locked loop (PLL) type, with LEDs for digital readout. The PLL divides the 4 MHz bandwidth into 400 channels every 10 kHz, with a push-button 5 kHz offset. Two frequency selector switches allow 100 kHz and 10 kHz switching respectively, with a four-position switch for choosing band segments. A three-position switch sets transmitter offset at 600 kHz up or down, plus simplex. A dual concentric volume-squelch control completes the package.

One way to measure a mobile radio's quality is what happens when the lights go out . . . can you use it in the dark? Or do you have to pack a flashlight to find out what frequency you're on? Not with the Kenwood. *Every* switchable function, from the synthesizer to the various squelch modes, has its own LED indicator. Six bright red 1" high LEDs tell you what frequency you're on, another LED indicates when you're transmitting, while still another warns that the synthesizer PLL has unlocked and the radio has automatically shut down. The TR-7400A even indicates what transmitter offset you're using, with an LED showing red for 600 kHz, green for +600 kHz, and no indication when in the simplex mode. What all this means is that the Kenwood makes after-dark mobiling a snap—no fumbling, no confusion to take your attention off the highway. After a few hours of operating the radio, it only takes a quick glance to see what frequency you're on, what offset you're using, and which squelch mode is engaged. During daylight operations, you won't have to squint to read the LEDs; all controls are well calibrated independent of the LEDs and are easy to find by touch. Counting from one repeater pair to another is made simpler by Kenwood's use of stops on the frequency selector controls, allowing you to only go once around before being forced to reverse direction.

My car suffers from a bad case of ignition noise. I've tried a number of "cures" with mixed results, and have come to accept that weak signals will have to be passed by until warmer weather allows a new assault on the MGB. Kenwood included a well-bypassed power input and it seems to work; my ignition noise is clearly lower with the TR-7400A than previous 2m rigs I've had in the MGB.

You may be wondering by now . . . what about the receiver? A glance at Kenwood's specifications on the TR-7400A shows impressive figures: more than 0.4 µV sensitivity for 20 dB quieting, image rejection of more than 70 dB, and spurious interference down more than 60 dB. The radio's performance certainly backs those claims, with trips into Boston, Hartford, and New York revealing no problems with desense and intermod. The sensitivity, compared to other current rigs, is highly competitive. Kenwood uses a double conversion superheterodyne with a 10.7 MHz 1st IF, and a 455 kHz 2nd IF. Large helical resonators, a 10.7 MHz monolithic crystal filter, and a MOSFET front end are also used.

In the mobile, the sensitivity and noise filtering add up to a surprising combination: strong, clear signals whether the strength is S1 or against the pin. There's plenty of audio on receive, more than enough to drive a good size remote speaker . . . or the one Kenwood built in. And unlike many squelch circuits I've used lately, dynamic range was outstanding, allowing me to squelch out unwanted repeaters that other radios received with the squelch fully engaged.

The TR-7400A comes complete with mounting bracket, microphone, and power cable. The mount is unique, with guide slots on both sides of the radio and clamp snaps to secure it. Hasplike protrusions extend from the sides of the radio, allowing you to padlock the rig into the car if desired. Most users will probably choose to take the TR-7400A with them, and the bracket makes for easy removal. The device includes an angle adjustment, allowing for tilting the radio in accordance with your dashboard. By some standards the Kenwood is large, measuring just over 7 inches wide by 3 inches high and just over a foot deep. It weighs about 6 pounds, but I had no trouble mounting it in my small sports car and did not find its size or weight objectionable. To the contrary, the TR-7400A is a high quality radio in the best Kenwood tradition. RF

Reprinted from the March 1977 issue of 73 Amateur Radio.

MaXcom®

"The ONLY, Absolutely, Completely, Fully, No Adjustment, Install It, Forget It, Works Even in Receive, All Frequency, Tougher than Lightning, Works Forever, Waterproof, Automatic Antenna Matcher"!!!

OVER 7,000 MAXCOM® STATIONS WORLDWIDE
THE BOTTOM LINE: "MAXCOM® WORKS".

P.O. Box 502
Fort Lauderdale • Florida 33302
Phone: 305-523-6369 • Fax: 305-522-8159

CIRCLE 101 ON READER SERVICE CARD

TOLL FREE **1-800-666-0908**
PRICING AND ORDERS ONLY

KENWOOD

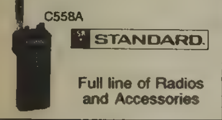
Full KENWOOD line
Radios & Accessories

YAESU

Call for All YAESU
Radios & Accessories

ALINCO

Full line of Radios
and Accessories



STANDARD.

Full line of Radios
and Accessories

ICOM

Full ICOM line
Radios & Accessories

AEA • ASTRON • COMET • CUSHCRAFT • DIAMOND • KANTRONICS • MFJ • SANGEAN • SONY SHORTWAVE • DRAKE • MANY MORE . . .

NEW EQUIPMENT PRICING AND ORDERS 1-800-666-0908 OUT OF STATE
TECHNICAL, USED GEAR, INFO 203-666-6227 24HR FAX 203-667-3561

LENTINI COMMUNICATIONS INC.
21 GARFIELD STREET, NEWINGTON, CT 06111
Hours: M–F 10-6
SAT 10-4
C.O.D.s OK
Same Day Shipping

CIRCLE 234 ON READER SERVICE CARD

Why buy a TNC?

PC HF FAX + PC SWL $179.00

SPECIAL COMBINATION OFFER

For a limited time, if you order PC HF FAX $99 (see our other ad in this issue), you can add our new and improved PC SWL 3.0 for $80.00 instead of our regular low price of $99.00.

PC SWL contains the hardware, software, instructions and frequency lists needed to allow you to receive a vast variety of digital broadcasts transmitted over shortwave radio. All you need is any IBM PC or compatible computer and an SSB shortwave receiver. The product consists of:

Demodulator
Digital Signal Processing Software
200 Page Tutorial Reference Manual
World wide Utility Frequency List
Tutorial Audio Cassette with Samples

PC SWL automatically decodes Morse code, RTTY, AMTOR, SITOR, NAVTEX and ASCII.

PC SWL lets you tune in on world press services meteorological broadcasts, ham radio operators, coastal shore stations, aviation telex and much more digital action on the shortwave bands. Why pay for another expensive box when a simple interface and your PC can do the job?

ADVANCED FEATURES:
Tuning Oscilloscope
Digital Waveform Presentations
Auto Calibration and Code Recognition
Continuously Tunable Filter Frequencies
Variable Shift
Adjustable CW Filter Sensitivity
Unattended Capture and Printing
Integrated Text Editor
Integrated Log and Database
Shell to DOS applications
Seamless Integration with PC HF Facsimile

Call or write for our complete catalog of products.
Visa & MasterCard welcome.

Software Systems Consulting
615 S. El Camino Real, San Clemente, CA 92672
Tel:(714)498-5784 Fax:(714)498-0568

CIRCLE 244 ON READER SERVICE CARD

CLIFF DWELLER ™
Antennas & Tower Components
P.O. BOX 5114, DOVER NH. 03820

NEW

Add
15 METER ECONOMY add on
to the 10 METER ECONOMY
model!
PATENT PENDING

6DB of gain over a dipole
Half wave loop, no coils or traps
NO SOLDERING, just attach the base to the 10 METER ECONOMY model. Next snap in the element, attach your 52 ohm feedline, tune for 1:1.
"ABOUT AN HOUR OF FUN & YOU'RE READY TO GO ON THE AIR"

10 meter economy model $89.00 +$20 UPS ea.
15 meter economy model $89.00 +$20 UPS ea.
SAVE $20.00 ORDER BOTH 10 & 15 ECONOMY MODELS FOR $158 + $40 UPS ea.*
*(must be shipped in two boxes)

COMPONENTS COME WITH
A VIDEO AND WRITTEN INSTRUCTIONS

CIRCLE 252 ON READER SERVICE CARD

RAMSEY ELECTRONICS

PHONE ORDERS CALL
716-924-4560
FAX 716-924-4555

FANTASTIC FM TRANSCEIVER KITS!

2 meters • 223 MHz • 440 MHz
only $149.95!
$169.95 for 440 MHz

Fully Synthesized - No Crystals

Ramsey breaks the price barrier on FM rigs! The FX is ideal for shack, portable, mobile or a dedicated packet rig. Wide frequency coverage (20 MHz) and programmable repeater splits makes the FX the perfect rig for CAP, MARS or business band snooping. Packeteers really appreciate the built-in packet I/O connector, true FM signal, instant T/R switching and 9600 baud capability. You get twelve channels – easily diode programmed anywhere you want, 5 watts RF output (3-4 for FX-440), sensitive dual conversion receiver with crystal and 6 pole ceramic IF filters, plus proven easy assembly.

You build your FX in stages of a few parts at a time, logically working your way along through each section, testing your work as you build. The only test equipment you'll need is a voltmeter and another radio or frequency counter. Our 120 page instruction manual will carefully guide you to a finished unit that will work first time – and you'll learn, too! Why pay more for a used foreign-made rig when you can have an AMERICAN MADE one (by you) for less? Kit comes complete with all parts, quality epoxy PC board with printed parts layout, and extensive manual. You only need to add an ICOM/Radio Shack/Yaesu style mike and suitable enclosure. The Ramsey matching case set includes all hardware, knobs and rugged steel case (weighs 3 lbs!), with durable black powder coat finish.

Building your own rig, isn't that what ham radio is all about? Is ham radio simply buying a foreign rig we just unpack and plug-in? Let's stop sending our dollars overseas, start building, learning, experimenting and regain our technological edge.

FX-146 (2 meters)	**$149.95**
FX-223 (1 1/4 meters)	**$149.95**
FX-440 (70 cm)	**$169.95**
CFX matching case set	**$ 24.95**

Still not sold? Order our FX manual and see for yourself! Only $10.00, refundable with purchase of transceiver kit.

FX manual, specify band desired - $10.00

2 METER & 220 BOOSTER AMP

BOOST THE OUTPUT OF YOUR 2 METER OR 220 MHZ HT OR RAMSEY TRANSCEIVER FOR A LOT LESS THAN THOSE HIGH-PRICED AMPS!

These power boosters deliver over 30 watts of output, while a low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of these units. Get the features of those high-priced boosters at a fraction of the cost!

PA-10 2 meter, prewired (10x power gain) - $89.95

PA-20 220 MHz, prewired (8x power gain) - $89.95

YOUR SATISFACTION IS GUARANTEED. Examine your Ramsey product for 10 days. If you're not pleased, return in original condition for refund. Add $3.75 for shipping handling and insurance. Foreign orders add 20% for surface mail. COD (US only) add $5.00. Orders under $20.00 add $3.00. NY residents add 7% sales tax. Warranty: 90 days on kit parts; 1 year parts and labor on pre-wired units.

PHONE ORDERS CALL
716-924-4560 FAX 716-924-4555

RAMSEY ELECTRONICS, INC • 793 Canning Parkway • Victor, NY • 14565

CIRCLE 34 ON READER SERVICE CARD

Removable Call Signs

PERFECT HOLIDAY GIFT

AMATEUR RADIO
W1AW

- No Call Letters Left on Vehicle
- Magnetic or Suction Cup Mounts
- Transferable from Car to Car
- Trunk or Rear Window Display

2 1/4"x8" ALL WEATHER PLASTIC! YOUR CALL OR REPEATER FREQUENCY. Order MAGNETIC or SUCTION-MOUNTED version. $9.95; 2/$18 (includes postage.) SELECT black, blue or red background.

SIGN ON
1923-R Edward Lane
Merrick, NY 11566

Serving Ham Operators for 10 Years

Satellite City

1-800-426-2891

YAESU

	LIST	
FT-1000D 200w, 160-10m, tuner	4399.00	Call $
FT-990 160-10m, 100w, PS tuner	2399.[illegible]	Call $
FT-767 GX Gen. Cvg Xcvr	[illegible]	Call $
FT-890/AT 10-160 100w	[illegible]	Call $
FT-747 GX Gen. [illegible]	[illegible]	Call $
FL-7000 15[illegible]	[illegible]	Call $
FT[illegible]	[illegible]	Call $
FT-650 [illegible]	[illegible]	Call $
FT-290R [illegible]	[illegible]	Call $
FT-690 [illegible]	[illegible]	Call $
FT-79[illegible]	[illegible]	Call $
FT-6200 [illegible]	[illegible]	Call $
FT-5200440 F[illegible]	[illegible]	Call $
FT-2400 50[illegible]	[illegible]	Call $
FT-212RH 45[illegible]	[illegible]	Call $
FT-470 2m, [illegible]	49[illegible].00	Call $
FT-411E 2m FM w/TT	355.00	Call $
FT-811 70cm,FM w/TT	394.00	Call $
FT-26R 2m, FM 2w HH	299.00	Call $
FT-415 2m, 2w FM HT	409.00	Call $

Fall Fun
FT-890/AT

ICOM

	LIST	
IC-781 Deluxe HF w/scope	6523.00	Call $
IC-765 Ge. Cvg Xcvr	2856.00	Call $
IC-735 Gen. Cvg Xcvr	1145.[illegible]	Call $
IC-728 New Transceiver	109[illegible]	Call $
IC-729 New Transceiver	[illegible]00	Call $
IC-R7000 [illegible] MHz	[illegible]	Call $
IC-71A 100[illegible]	[illegible]	Call $
IC[illegible]	[illegible]	Call $
IC-475[illegible]	[illegible]	Call $
IC-24[illegible]	[illegible]	Call $
IC-32[illegible]	[illegible]	Call $
IC-22[illegible]	[illegible]	Call $
IC-229H 50[illegible]	[illegible]	Call $
IC-228H 2m, 4[illegible]	[illegible]	Call $
IC-W2A 2m/40[illegible]	[illegible]	Call $
IC-24AT 2m 7[illegible]	[illegible]00	Call $
IC-2SAT 2m mini [illegible]	3[illegible].00	Call $
IC-P2AT New 2m mini 2.[illegible] w/TTP	412.00	Call $
IC-3SAT 220MHz w/TT HH	357.00	Call $
IC-4SAT 440MHz w/TT HH	392.00	Call $
IC-4GAT 440MHz w/TT HH	392.00	Call $

Fall Fun
IC-765

NEW
KENWOOD

Alinco
Butternut
Hustler
Lakeview
Sony
AEA
Cushcraft
KAM
Larsen
Standard
Astron
Daiwa
Kantronics
MFJ
Vibroflex
Bencher
Digital
KLM/Mirage
R.F. Concepts
Comet

NOW CANADA

1-800-426-2891
METRO: (612) 786-4475
2663 County Rd. I
Mounds View, MN 55112

Super Minnesota Watts 1-800-279-1503

CIRCLE 153 ON READER SERVICE CARD

Joe Carr
K4IPV

antennas, etc.

by Joseph Carr K4IPV

Using a Loop Antenna for HF Receiving

What would you say if I told you that it is sometimes better to use a second antenna for receiving, and that a highly appropriate second antenna actually has considerably less gain than the antenna used for transmitting? Don't believe it? Is Carr smoking some funny weed, or something? Well . . . I don't smoke, and the proposition makes real good sense on some bands, especially 75/80 meters.

The antenna that I am talking about is the receiving loop antenna. These antennas (Figure 1) are multi-turn coils of large diameter, and are resonated by a capacitor. They are highly directional, and produce a figure-eight pattern with two maxima and two deep nulls. We'll talk about the details of making such loops shortly.

So why is a separate antenna a good idea on 75/80 meters? Because that band is a high density, multi-kilowatt electromagnetic oven, that's why. In kilowatt alley the QRM can be fiercer than fierce. Consider the two most common "antlers" used on 75/80 meters: *half-wavelength dipoles* and *quarter-wavelength* or *coil-loaded verticals*. The half-wavelength antenna is bidirectional but, especially for antennas close to the ground, the pattern is very broad.

By definition, verticals are broad patterned because they are omnidirectional in the azimuthal plane. As a result, these antennas receive beaucoup signals from all directions. The range of signal strengths is, I suspect, greater than the dy-

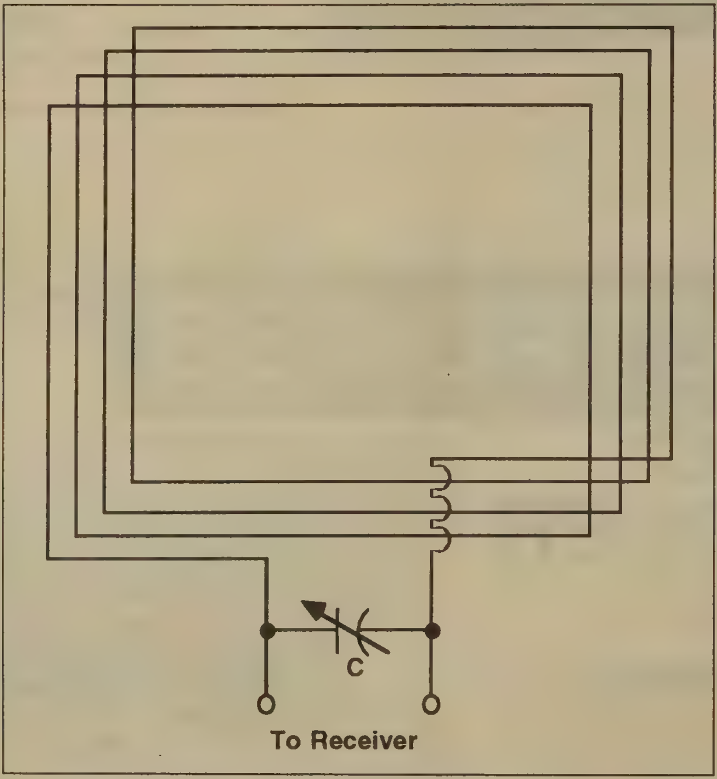


Figure 1. Diagram of a receiving loop antenna.

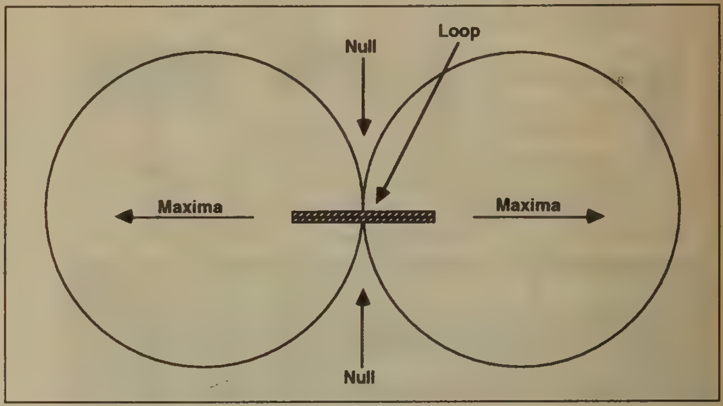


Figure 2. A loop antenna has two nulls located broadside to the loop face and two maxima off of the ends.

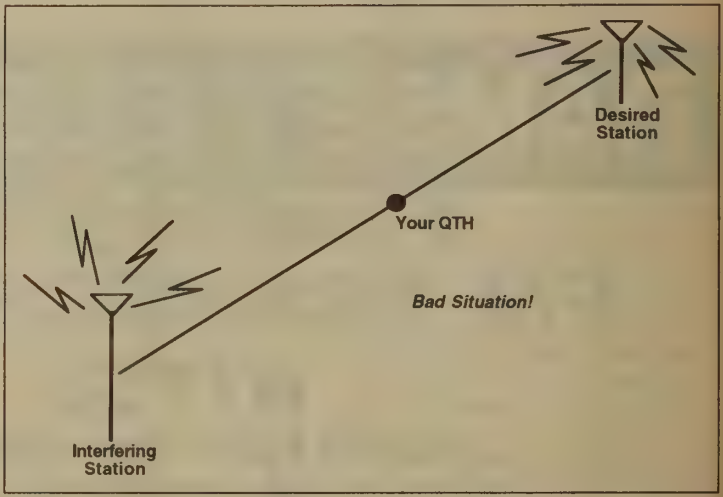


Figure 3. It's possible to null out an undesired signal unless your station falls too near a straight line between the station you want to work and and the interfering signal.

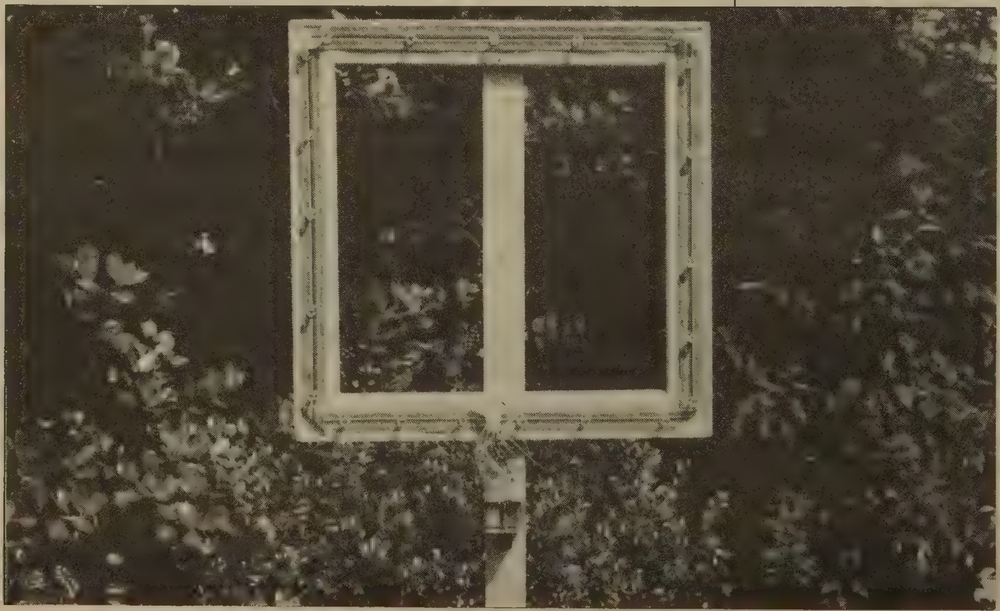


Photo A. A basic loop that can be used on any of the lower HF bands.

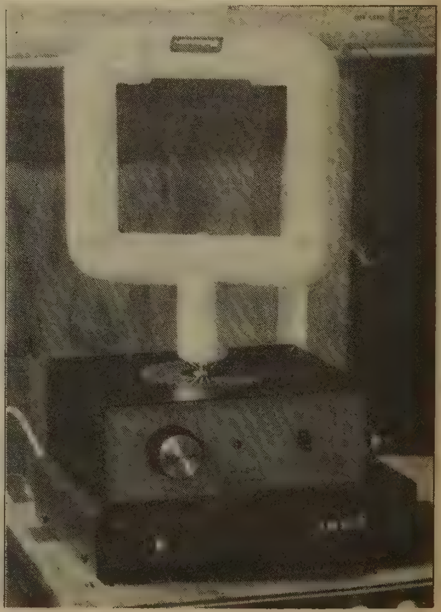


Photo B. The Palomar Engineers loop antenna.

namic range of a compact audio disk, and (I suspect) greater than the dynamic range of many receivers. And it's not just the strength of single signals that hurts, but the combined strengths of all signals within, or close to, the normal passband of the receiver. You will be surprised, no doubt, to find relatively strong signals obscured beneath the bandbusters, and they can be worked if you could only hear them. And that's where the loop comes in.

A loop antenna has two nulls that are located broadside to the loop face, and two maxima that are off the ends of the loop (Figure 2). As long as your location does not fall on, or too near, the line between the station you want to work and the interfering station (Figure 3), then it is possible to null out the undesired signal. The idea is to point the loop null in the direction of the undesired station, causing its signal strength to be reduced tremendously as far as your receiver is concerned. The desired signal will not be as strong as it might have been on the main antenna, but because the interfering signal is reduced the desired-signal-to-crud ratio is greatly improved.

> **"The idea is to point the loop null in the direction of the undesired station, causing its signal strength to be reduced tremendously . . ."**

While listening would've been difficult, traumatic or impossible before, the situation is a lot better once the DSBG is stuffed into the null.

We don't have space here to go too deeply into loop construction, but at least some details can be shown. For those who want more information, may I most immodestly recommend the loop antennas chapter in my book *Receiving Antenna Handbook* (HighText Publications, Inc., 7128 Miramar Road, #15, San Diego CA 92121; 619-693-5900). Photo A shows a basic loop that can be used on any of the lower HF bands, the AM BCB and in the VLF region (depending on the number of turns). For 75/80 meters use about five turns of wire, closely wound over a width of 1 cm or so. In the version that I built recently, the loop resonated at 3750 kHz with about 75 pF of capacitance.

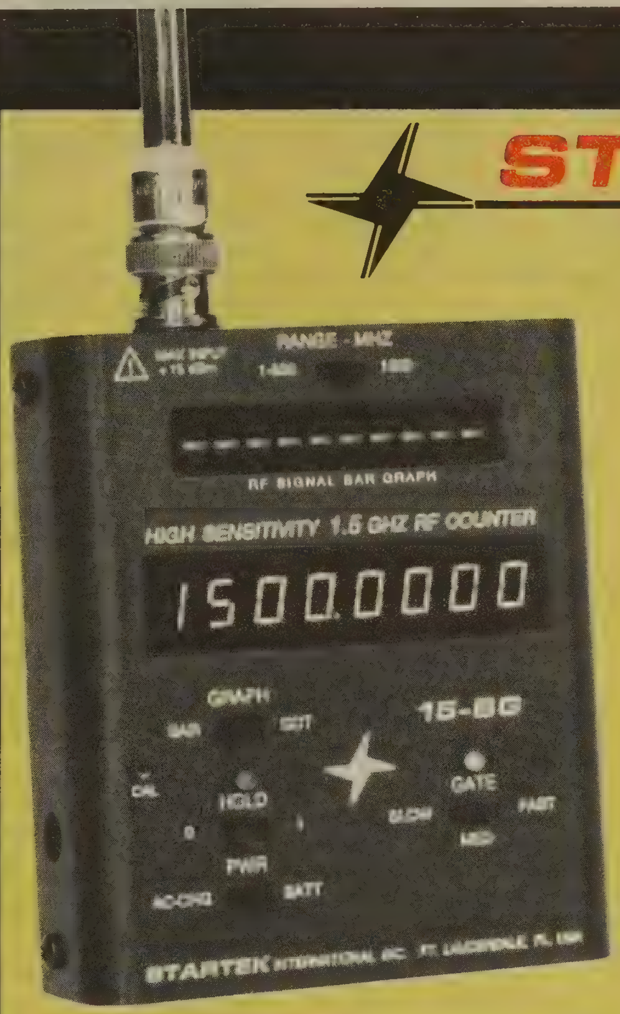
If you don't want to mess with building a loop antenna of your own, then there are several available on the market. Look especially to the shortwave listener suppliers for possible products. Both EEB (323 Mill Street, Vienna VA 22180; 1-800-368-3350) and Universal Radio (6830 Americana Pkwy., Reynoldsburg OH 43068; 614-866-4267) catalogs show several loops that are suitable. I've had reasonable success with the Palomar Engineers loops (Photo B). These, and others, are available at EEB and Universal.

Wanna Read a Good Book?

Harry Helms AA6FW is nuts—nuts about ham radio, that is. His recently released book *All About Ham Radio* (HighText, see address above) is a refreshing look at ham radio from a totally honest perspective. It's one of the best books for the newcomer that I've seen in a long time. Harry sent me a copy last summer. At first skeptical about still another book for pre-Novices and other newcomers, I quickly became a convert to Harry's effort (jealous, actually). Even though the book deals with a lot of technical, regulatory and operating matters, Harry appeals to both the old-timer and the newcomer because he covers these subjects in appropriate depth, but without the technical snobbery seen in a lot of ham radio books. It's just plain talk—that's all, and it's all useful, with no fluff and no fat. RF

STARTEK

FREQUENCY COUNTERS


RANGE - MHZ
1-400
100
RF SIGNAL BAR GRAPH
HIGH SENSITIVITY 1.5 GHZ RF COUNTER
1500.0000
GRAPH
BAR
15-BG
GATE
HOLD
PWR
BATT
AC-CHG
STARTEK INTERNATIONAL INC FT. LAUDERDALE FL USA

MODEL 15-BG

ULTRA HIGH SENSITIVITY
RF DETECTOR - COUNTER
2 INCH LED BAR GRAPH

Regular $220. value !!

$169.

SPECIAL LIMITED TIME OFFER
PLEASE MENTION THIS AD FOR SPECIAL PRICE

STANDARD FEATURES FOR ALL 6 MODELS

- *3 to 5 HOUR* BATTERY PORTABLE OPERATION
- NI-CAD BATTERIES & 110VAC ADP/CHARGER INC.
- 1 PPM TCXO TIME BASE WITH EXTERNAL ADJ.
- 3 GATE TIMES, AUTO DECIMAL PLACEMENT
- HOLD SWITCH (WORKS PROPERLY- NO GATE CHG)
- 9-12VDC AUTO-POLARITY POWER INPUT
- StarCab™ QUALITY ALUMINUM CABINET
- COMPUTER AIDED CIRCUIT DESIGN
- TOP QUALITY COMPONENTS - SOCKETED IC's
- COMPATABLE WITH MFJ-207/208 ANT. ANALYZERS
- FULL YEAR PARTS & LABOR LIMITED WARRANTY
- DESIGNED & ASSEMBLED IN THE USA

STARTEK Bar Graph counters are *simply the best* for finding frequencies, testing, adjusting, repairing or locating RF devices. Superior sensitivity, longer battery operation, high quality USA construction and sub-compact size are just a few of the reasons to select a **STARTEK** counter.

ACCESSORIES:

#CC-90	BLACK VINYL CARRYING CASE	$12.00
#TA-90	TELESCOPING BNC ANTENNA	12.00
#P-110	PROBE, 200 MHZ, 1X-10X	39.00
#M207IC	CABLE FOR MFJ-207/208	10.00

SAME DAY SHIPMENT

FACTORY
DIRECT
ORDER
LINES

Orders & Information
305-561-2211
Orders only
800-638-8050
FAX 305-561-9133

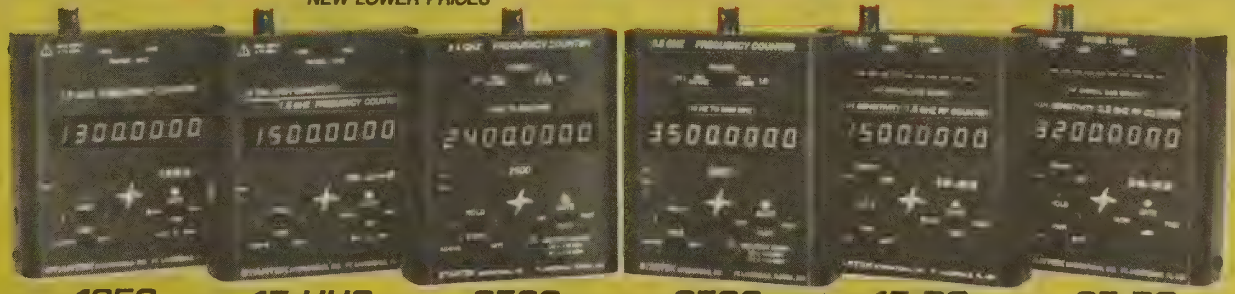
MasterCard VISA DISCOVER

STARTEK INTERNATIONAL INC
398 NE 38th St., Ft. Lauderdale, FL 33334

TERMS: Shipping-handling charges for Florida add $4 + tax, US & Canada add 5% ($4 min - $10 max), others add 15% of total. COD fee $4. VISA, MC or DISCOVER accepted. Prices & specifications subject to change without notice or obligation.

SELECT YOUR **STARTEK** *POCKET COUNTER™* TODAY !

* *NEW LOWER PRICES*



1350	15-UHS	2500	3500	15-BG	35-BG
1 MHZ - 1300 MHZ QUALITY & ECONOMY (REPLACES #1500A) $129	1 MHZ - 1500 MHZ ULTRA HIGH SENSITIVITY (REPLACES #1500HS) *$159	10 HZ - 2400 MHZ HI-Z INPUT - LO RANGE HIGH SENSITIVITY *$189	10 HZ - 3500 MHZ HI-Z INPUT - LO RANGE HIGH SENSITIVITY $250	1 MHZ - 1500 MHZ ULTRA HIGH SENSITIVITY 2 INCH BAR GRAPH $SPECIAL$	1 MHZ - 3200 MHZ ULTRA HIGH SENSITIVITY 2 INCH BAR GRAPH $265

CIRCLE 247 ON READER SERVICE CARD

what's next?

by Carole Perry WB2MGP

Education Through Communication

It's always fun meeting the different teachers who check in to the CQ All Schools net with their classes. One of the original goals of the net (besides having fun) was to have a meeting place for teachers with similar interests to share ideas with each other. The very fact that we're from different parts of the country and from a variety of economic situations adds to the enrichment of the exchanges of information and ideas.

There are some things that teachers everywhere have in common with each other, just as all children have many needs and interests that are similar to their counterparts in other regions. There is a fine art and technique to pointing out the similarities and respecting the differences in such a way as to make youngsters appreciate other people. As a teacher I love leading the children into these wonderful communication experiences which occur all the time in a ham radio class.

Mike Zane K6URI

One of the really super contacts we made on the net is Mike Zane K6URI. Mike is a retired Lodi, California, police sergeant and a member of the Lodi Amateur Radio Club. Last February, when Mike went on vacation to Aruba, he notified me ahead of time that he'd be taking his FT-757 transceiver and a mobile whip for 20-15-10 meters. Sure enough, he was able to contact us and say "hi" to the kids in my classroom on the CQ All Schools net. Needless to say, the children loved getting the "goodies" that Mike was nice enough to send the class from Aruba.

Through the last few months, we on the net have been giving Mike encouragement to get a ham radio program going at a local school. So I was delighted recently to hear from Mike that the Le Roy Nichols Elementary School Amateur Radio Club was formed in January 1992 as an after-school club that meets one day a week. Mike believes that the radio club can give the kids an alternative to getting into trouble. Getting involved with amateur radio is far more productive than "hanging out" and getting involved with drugs and gangs.

Mike tells me that the school district gave him the following rules: can't COST the district any money, has to meet after school, and he can't electrocute any of the kids. Does this sound familiar to those of you who have gone this route?

In many of our conversations Mike and I agreed that a regular ham radio course in a school is the best possible scenario. However, we both acknowledge that it is prudent to get the proverbial foot in the door and let the kids' enthusiasm take it from there. Mike and his ham friends know that amateur radio can help the kids learn science, math, geography, and writing and verbal communication skills. The club has boys and girls from 4th to 6th grade. Mike tells me that the students have varied reasons for joining the club; most, however, just want to talk over the radio.

Photo A. Nichols Elementary School Ham Club members Annie (5th grade), Daanish (5th grade), Ali (4th grade) and Andrew (5th grade) working on their telegraph keys.

Lodi's Field and Fair Day

On September 7th, Lodi celebrated Labor Day with a "Field and Fair Day" at the local community center. The Lodi Amateur Radio Club does the communications for the Field and Fair Day 10k and 20k races. This year the Nichols Elementary School Ham Club had its first radio demo booth. Some of the kids were there to "ham it up." They even had some 7th graders from last year's ham club. They set up early Monday morning and started hamming at 9:30 a.m., stopping at 3:30 p.m. The youngsters made 40 contacts on 40 meters during that time.

Photo B. Mike Garcia (6th grade), James Daire (7th grade), Mike Zane K6URI (with hot dog) and Annie Siegfried (5th grade) at the Lodi Field and Fair Day.

Mike would like to share a clever idea he came up with. They didn't have any place to set up an antenna and they didn't want to use a mobile antenna, especially on 40 meters. Our resourceful ham took a 4-foot by 8-foot, 1-1/4-inch-thick piece of plywood and drilled it on one end to fit the 20" x 20" metal plate base of their 30-foot lightweight tower. The tower was bolted on and then he drove his pickup over the other end so that the weight of the truck held it down. Usually, they stake the tower base down and guy it for portable or Field Day use. The pickup held it down with no problems.

The group used two Hamstick 40 meter mobile whips back-to-back as a 40 meter dipole at 30 feet. Mike says it worked like a charm. Also in use was a Yaesu 757 mobile transceiver at 100W. Most signal reports gave them between 55 to 59, from Vancouver, Washington, to San Diego, California.

The children handed out information sheets about the Nichols Amateur Radio Club and about ham radio in general. Lots of adults were interested in what the youngsters were doing and asked many questions. Several adults couldn't believe that the kids were really talking to people so far away.

One of the girls, Annie, who is a 10-year-old 5th grader, is a very shy, self-conscious young lady. She didn't participate much until after about an hour and a half when a ham from San Jose mentioned that his nine-year-old daughter Janelle was starting to learn about ham radio. Mike was able to get Annie to talk to Janelle on the radio. They wound up having a 20-minute conversation about school and girl stuff. After that Annie made about 12 more contacts and pitched right in. The next week at the ham club meeting the children started making their own code practice keys and Annie was right there participating too.

Through donations of radio equipment and other ham-related items from Lodi hams and others around northern California, the school club is a NO COST endeavor to the school itself, or to the Lodi Unified School District. Right now, Mike is hoping that the PTA will buy them a Kenwood TS-450 so he can use one of his computers with the "Ham Windows" program. Also in the works are plans for a packet station and possible future participation in the SAREX program.

If you are a ham radio operator with some time on your hands and a strong desire to help young people get started in radio, take a lesson from Mike. It's hard work, but it's always worth all the effort when you can be instrumental in helping children get on the right track in ham radio and in life.

Please join us on the CQ All School net on Tuesdays and Thursdays at 16:30 UTC on 28.303 MHz. After the time change, look for us at 17:30 UTC. RF

KITS • KITS • KITS

You can build your whole
Amateur Radio Station!
Send for our FREE 28 page catalog of Transceivers, Receivers, VFO's, Transmitters, Active Antennas, Antenna Tuners, Digital Readouts, and more!!!

Townsend Electronics, Inc.
P.O. Box 415
Pierceton, IN 46562
1-219-594-3661
Include $1.00 for 1st Class Postage
$2.00 for Foreign Countries

CIRCLE 299 ON READER SERVICE CARD

HANDIE-BASE
(PATENT MAILED)
For Your Handheld Radio or Handheld Scanner. Features Include: Solid Walnut Base, Powder Coated Steel Frame, Non-slip Rubber Feet, 5 year Warranty. Models Available for Most Radios or Scanners. Works on Desktops, Tabletops, Work Benches, or any Flat Surface. Add An Extension Speaker/Mic, Power Supply & External Antenna and It Converts Your Handheld Radio Into A Base Station. To order send $14.95 plus $3.50 shipping to:

Handie-Base & More Inc.
P.O. Box 2504, Dept. D-2
Broken Arrow, OK 74013-2504
(Please Specify the Size of Your Handheld Radio - Small or Regular)

Circle 182 on reader service card.

JAN Crystals
your reliable source for a world of crystal clear communication

- Commercial Two-Way
- MicroProcessors
- Amateur/Experimental
- Scanners/Monitors/Pagers
- Satellite-Telemetry
- Plus custom applications

EXPEDITED ORDER SERVICE!
FOR FREE CATALOG, CALL OR WRITE:
JAN CRYSTALS
P.O. Box 06017 Ft. Myers, FL 33906
VISA
MasterCard
TOLL FREE 1-800-526-9825
(813) 936-2397 FAX ORDERS: 1-813-936-3750

CIRCLE 240 ON READER SERVICE CARD

AMATEUR TELEVISION
TVC-4G
only $89
SEE THE SPACE SHUTTLE VIDEO
Many ATV repeaters and individuals are retransmitting Space Shuttle Video & Audio from their TVRO's tuned to Satcom F2-R transponder 13. Others may be retransmitting weather radar during significant storms. If it is being done in your area on 70 CM - check page 413 in the 91-92 ARRL Repeater Directory or call us, ATV repeaters are springing up all over - all you need is one of the TVC-4G ATV 420-450 MHz downconveters, add any TV set to ch 2, 3 or 4 and a 70 CM antenna. We also have downconverters and antennas for the 900 and 1200 MHz amateur bands. In fact we are your one stop for all your ATV needs and info. Hams, call for our complete ATV catalog - antennas, transceivers, amplifiers. We ship most items within 24 hours after you call.
(818) 447-4565 m-f 8am-5:30pm pst.
Visa, MC, COD
P.C. ELECTRONICS
2522-WG Paxson Ln Arcadia CA 91007
Tom (W6ORG)
Maryann (WB6YSS)

DON'T MISS OUT!
SUBSCRIBE TO
Radio Fun
FOR ONLY $12.97!

2 GREAT ISSUES!

scribe Now! 12 issues for $12.97.

adio Fun for the low price of $12.97.

46. (In New Hampshire, call 603-924-0058).

se print) Call

Zip

ayment enclosed

). date

__QST Subscriber___CQ Subscriber___

ate $24. Basic subscription rate $14.97. **05H**

CONTACT YOUR ADVERTISERS EASILY!

FILL OUT THIS FREE READER SERVICE CARD AND SEND IT TODAY!

DER SERVICE CARD
December 1992
THIS CARD VALID UNTIL 1/31/93

7	8	9	10	201	202	203	204	205	206	207	208	209	210
17	18	19	20	211	212	213	214	215	216	217	218	219	220
27	28	29	30	221	222	223	224	225	226	227	228	229	230
37	38	39	40	231	232	233	234	235	236	237	238	239	240
47	48	49	50	241	242	243	244	245	246	247	248	249	250
57	58	59	60	251	252	253	254	255	256	257	258	259	260
67	68	69	70	261	262	263	264	265	266	267	268	269	270
77	78	79	80	271	272	273	274	275	276	277	278	279	280
87	88	89	90	281	282	283	284	285	286	287	288	289	290
97	98	99	100	291	292	293	294	295	296	297	298	299	300
107	108	109	110	301	302	303	304	305	306	307	308	309	310
117	118	119	120	311	312	313	314	315	316	317	318	319	320
127	128	129	130	321	322	323	324	325	326	327	328	329	330
137	138	139	140	331	332	333	334	335	336	337	338	339	340
147	148	149	150	341	342	343	344	345	346	347	348	349	350
157	158	159	160	351	352	353	354	355	356	357	358	359	360
167	168	169	170	361	362	363	364	365	366	367	368	369	370
177	178	179	180	371	372	373	374	375	376	377	378	379	380
187	188	189	190	381	382	383	384	385	386	387	388	389	390
197	198	199	200	391	392	393	394	395	396	397	398	399	400

IFORMATION

05L

advertised in this issue of Radio Fun circle
quiry. Offer valid in the U.S. and possessions only.

NO OTHER MAGAZINE BRINGS YOU THE EXCITING WORLD OF AMATEUR RADIO LIKE

73 Amateur Radio Today

2 ISSUES ONLY $19.97!

s Holiday!

n all) of 73 for the low price of $19.97!
e) Mail this postage paid card today.
: 800-289-0388 **(In CO., call 303-447-9330).**

(please print) Call

State Zip

sed ☐ **Bill me**
C ☐ **Visa** ☐ **Amex**

Exp. date

4QBW4

). Basic subscription rate $24.97 (Canadian orders
s $1.40 GST; other foreign countries add $19.00 per
42.00 per year for airmail. Please allow 4-6 weeks
e.

what's next?

by Carole Perry WB2MGP

Photo B. Mike Garcia (6th grade), James Daire (7th grade), Mike Zane K6URI (with hot dog) and Annie Siegfried (5th grade) at the Lodi Field and Fair Day.

Education Through Communication

It's always fun meeting the different teachers who check in to the CQ All Schools net with their classes. One of the original goals of the net (besides having fun) was to have a meeting place for teachers with similar interests to share ideas with each other. The very fact that we're from different parts of the country and from a variety of economic situations adds to the enrichment of the exchanges of information and ideas.

There are some things that teachers everywhere have in common with each other, just as all children have many needs and interests that are similar to their counterparts in other regions. There is a fine art and technique to pointing out the similarities and respecting the differences in such a way as to make youngsters appreciate other people. As a teacher I love leading the children into these wonderful communication experiences which occur all the time in a ham radio class.

Mike Zane K6URI

One of the really super contacts we made on the net is Mike Zane K6URI. Mike is a retired Lodi, California, police sergeant and a member of the Lodi Amateur Radio Club. Last February, when Mike went on vacation to Aruba, he notified me ahead of time that he'd be taking his FT-757 transceiver and a mobile whip for 20-15-10 meters. Sure enough, he was able to contact us and say "hi" to the kids in my classroom on the CQ All Schools net. Needless to say, the children loved getting the "goodies" that Mike was nice enough to send the class from Aruba.

Through the last few months, we on the net have been giving Mike encouragement to get a ham radio program going at a local school. So I was delighted recently to hear from Mike that the Le Roy Nichols Elementary School Amateur Radio Club was formed in January 1992 as an after-school club that meets one day a week. Mike believes that the radio club can give the kids an alternative to getting into trouble. Getting involved with amateur radio is far more productive than "hanging out" and getting involved with drugs and gangs.

Mike tells me that the school district gave him the following rules: can't COST the district any money, has to meet after school, and he can't electrocute any of the kids. Does this sound familiar to those of you who have gone this route?

In many of our conversations Mike and I agreed that a regular ham radio course in a school is the best possible scenario. However, we both acknowledge that it is prudent to get the proverbial foot in the door and let the kids' enthusiasm take it from there. Mike and his ham friends know that amateur radio can help the kids learn science, math, geography, and writing and verbal communication skills. The club has boys and girls from 4th to 6th grade. Mike tells me that the students have varied reasons for joining the club; most, however, just want to talk over the radio.

Photo A. Nichols Elementary School Ham Club members Annie (5th grade), Daanish (5th grade), Ali (4th grade) and Andrew (5th grade) working on their telegraph keys.

Lodi's Field and Fair Day

On September 7th, Lodi celebrated Labor Day with a "Field and Fair Day" at the local community center. The Lodi Amateur Radio Club does the communications for the Field and Fair Day 10k and 20k races. This year the Nichols Elementary School Ham Club had its first radio demo booth. Some of the kids were there to "ham it up." They even had some 7th graders from last year's ham club. They set up early Monday morning and started hamming at 9:30 a.m., stopping at 3:30 p.m. The youngsters made 40 contacts on 40 meters during that time.

Mike would like to share a clever idea he came up with. They didn't have any place to set up an antenna and they didn't want to use a mobile antenna, especially on 40 meters. Our resourceful ham took a 4-foot by 8-foot, 1-1/4-inch-thick piece of plywood and drilled it on one end to fit the 20" x 20" metal plate base of their 30-foot lightweight tower. The tower was bolted on and then he drove his pickup over the other end so that the weight of the truck held it down. Usually, they stake the tower base down and guy it for portable or Field Day use. The pickup held it down with no problems.

The group used two Hamstick 40 meter mobile whips back-to-back as a 40 meter dipole at 30 feet. Mike says it worked like a charm. Also in use was a Yaesu 757 mobile transceiver at 100W. Most signal reports gave them between 55 to 59, from Vancouver, Washington, to San Diego, California.

The children handed out information sheets about the Nichols Amateur Radio Club and about ham radio in general. Lots of adults were interested in what the youngsters were doing and asked many questions. Several adults couldn't believe that the kids were really talking to people so far away.

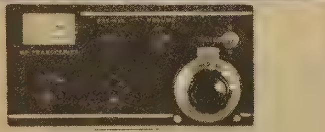
One of the girls, Annie, who is a 10-year-old 5th grader, is a very shy, self-conscious young lady. She didn't participate much until after about an hour and a half when a ham from San Jose mentioned that his nine-year-old daughter Janelle was starting to learn about ham radio. Mike was able to get Annie to talk to Janelle on the radio. They wound up having a 20-minute conversation about school and girl stuff. After that Annie made about 12 more contacts and pitched right in. The next week at the ham club meeting the children started making their own code practice keys and Annie was right there participating too.

Through donations of radio equipment and other ham-related items from Lodi hams and others around northern California, the school club is a NO COST endeavor to the school itself, or to the Lodi Unified School District. Right now, Mike is hoping that the PTA will buy them a Kenwood TS-450 so he can use one of his computers with the "Ham Windows" program. Also in the works are plans for a packet station and possible future participation in the SAREX program.

If you are a ham radio operator with some time on your hands and a strong desire to help young people get started in radio, take a lesson from Mike. It's hard work, but it's always worth all the effort when you can be instrumental in helping children get on the right track in ham radio and in life.

Please join us on the CQ All School net on Tuesdays and Thursdays at 16:30 UTC on 28.303 MHz. After the time change, look for us at 17:30 UTC. RF

KITS • KITS • KITS



You can build your whole Amateur Radio Station!

Send for our FREE 28 page catalog of Transceivers, Receivers, VFO's, Transmitters, Active Antennas, Antenna Tuners, Digital Readouts, and more!!!

Townsend Electronics, Inc.
P.O. Box 415
Pierceton, IN 46562
1-219-594-3661

Include $1.00 for 1st Class Postage
$2.00 for Foreign Countries

CIRCLE 299 ON READER SERVICE CARD

HANDIE-BASE

(PATENT MAILED)

For Your Handheld Radio or Handheld Scanner. Features Include: Solid Walnut Base, Powder Coated Steel Frame, Non-slip Rubber Feet, 5 year Warranty. Models Available for Most Radios or Scanners. Works on Desktops, Tabletops, Work Benches, or any Flat Surface. Add An Extension Speaker/Mic, Power Supply & External Antenna and It Converts Your Handheld Radio Into A Base Station. To order send $14.95 plus $3.50 shipping to:

Handie-Base & More Inc.
P.O. Box 2504, Dept. D-2
Broken Arrow, OK 74013-2504
(Please Specify the Size of Your Handheld Radio - Small or Regular)

Circle 182 on reader service card.

JAN Crystals

your reliable source for a world of crystal clear communication

- Commercial Two-Way
- MicroProcessors
- Amateur/Experimental
- Scanners/Monitors/Pagers
- Satellite-Telemetry
- Plus custom applications

EXPEDITED ORDER SERVICE!

FOR FREE CATALOG, CALL OR WRITE:

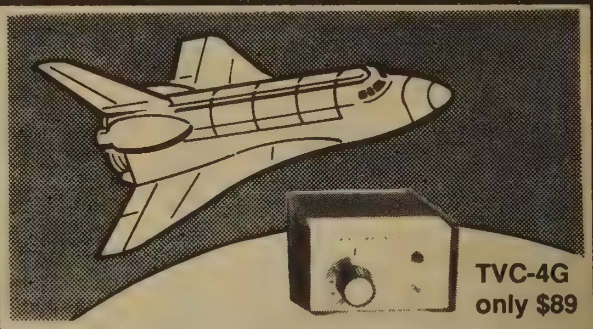
VISA MasterCard

JAN CRYSTALS
P.O. Box 06017 Ft. Myers, FL 33906

TOLL FREE 1-800-526-9825
(813) 936-2397 FAX ORDERS: 1-813-936-3750

CIRCLE 240 ON READER SERVICE CARD

AMATEUR TELEVISION



SEE THE SPACE SHUTTLE VIDEO

Many ATV repeaters and individuals are retransmitting Space Shuttle Video & Audio from their TVRO's tuned to Satcom F2-R transponder 13. Others may be retransmitting weather radar during significant storms. If it is being done in your area on 70 CM - check page 413 in the 91-92 ARRL Repeater Directory or call us, ATV repeaters are springing up all over - all you need is one of the TVC-4G ATV 420-450 MHz downconveters, add any TV set to ch 2, 3 or 4 and a 70 CM antenna. We also have downconverters and antennas for the 900 and 1200 MHz amateur bands. In fact we are your one stop for all your ATV needs and info. Hams, call for our complete ATV catalog - antennas, transceivers, amplifiers. We ship most items within 24 hours after you call.

(818) 447-4565 m-f 8am-5:30pm pst. Visa, MC, COD
P.C. ELECTRONICS
2522-WG Paxson Ln Arcadia CA 91007
Tom (W6ORG)
Maryann (WB6YSS)

DON'T MISS OUT!
SUBSCRIBE TO
Radio Fun
OR ONLY $12.97!

2 GREAT ISSUES!

scribe Now! 12 issues for $12.97.

adio Fun for the low price of $12.97.

46. (In New Hampshire, call 603-924-0058).

se print) Call

Zip

ayment enclosed

. date

__QST Subscriber___CQ Subscriber___

ate $24. Basic subscription rate $14.97. **05H**

CONTACT YOUR
ADVERTISERS
EASILY!
FILL OUT THIS
FREE
READER SERVICE CARD
AND SEND IT TODAY!

ER SERVICE CARD
December 1992
THIS CARD VALID UNTIL 1/31/93

7	8	9	10	201	202	203	204	205	206	207	208	209	210
17	18	19	20	211	212	213	214	215	216	217	218	219	220
27	28	29	30	221	222	223	224	225	226	227	228	229	230
37	38	39	40	231	232	233	234	235	236	237	238	239	240
47	48	49	50	241	242	243	244	245	246	247	248	249	250
57	58	59	60	251	252	253	254	255	256	257	258	259	260
67	68	69	70	261	262	263	264	265	266	267	268	269	270
77	78	79	80	271	272	273	274	275	276	277	278	279	280
87	88	89	90	281	282	283	284	285	286	287	288	289	290
97	98	99	100	291	292	293	294	295	296	297	298	299	300
107	108	109	110	301	302	303	304	305	306	307	308	309	310
117	118	119	120	311	312	313	314	315	316	317	318	319	320
127	128	129	130	321	322	323	324	325	326	327	328	329	330
137	138	139	140	331	332	333	334	335	336	337	338	339	340
147	148	149	150	341	342	343	344	345	346	347	348	349	350
157	158	159	160	351	352	353	354	355	356	357	358	359	360
167	168	169	170	361	362	363	364	365	366	367	368	369	370
177	178	179	180	371	372	373	374	375	376	377	378	379	380
187	188	189	190	381	382	383	384	385	386	387	388	389	390
197	198	199	200	391	392	393	394	395	396	397	398	399	400

FORMATION **05L**

advertised in this issue of Radio Fun circle
quiry. Offer valid in the U.S. and possessions only.

NO OTHER MAGAZINE BRINGS YOU THE EXCITING WORLD OF AMATEUR RADIO LIKE

73 Amateur Radio Today

2 ISSUES ONLY $19.97!

s Holiday!

n all) of 73 for the low price of $19.97!
e) Mail this postage paid card today.
: 800-289-0388 (In CO., call 303-447-9330).

(please print) Call

State Zip

sed ☐ Bill me
C ☐ Visa ☐ Amex

Exp. date

4QBW4

. Basic subscription rate $24.97 (Canadian orders
s $1.40 GST; other foreign countries add $19.00 per
42.00 per year for airmail. Please allow 4-6 weeks
e.

DON'T MISS OUT!
SUBSCRIBE TO
Radio Fun
FOR ONLY $12.97!

12 GREAT ISSUES!

CONTACT YOUR
ADVERTISERS
EASILY!

FILL OUT THIS
FREE
READER SERVICE CARD
AND SEND IT TODAY!

NO OTHER
MAGAZINE BRINGS
YOU THE EXCITING
WORLD OF
AMATEUR RADIO
LIKE

73 Amateur
Radio Today

12 ISSUES ONLY $19.97

Radio Fun

Subscribe Now! 12 issues for $12.97.

__**YES!** Send me one year (12 issues) of Radio Fun for the low price of $12.97.

For instant service call toll free **1-800-257-2346**. (In New Hampshire, call 603-924-0058).

Name (please print) Call

Address

City State Zip

Charge my: ☐ MC ☐ Visa ☐ Payment enclosed

Card Number Exp. date

Class License_____Year Licensed___ 73 Subscriber___QST Subscriber___CQ Subscriber___

Canada add $8. Foreign add $12 surface, $36 airmail. Newstand rate $24. Basic subscription rate $14.97. 05H

Radio Fun

READER SERVICE CARD

December 1992

THIS CARD VALID UNTIL 1/31/93

NAME CALL

ADDRESS

CITY STATE ZIP

Where did you get this copy of Radio Fun?

A ☐ Newstand B ☐ Subscription

1	2	3	4	5	6	7	8	9	10	201	202	203	204	205	206	207	208	209	210
11	12	13	14	15	16	17	18	19	20	211	212	213	214	215	216	217	218	219	220
21	22	23	24	25	26	27	28	29	30	221	222	223	224	225	226	227	228	229	230
31	32	33	34	35	36	37	38	39	40	231	232	233	234	235	236	237	238	239	240
41	42	43	44	45	46	47	48	49	50	241	242	243	244	245	246	247	248	249	250
51	52	53	54	55	56	57	58	59	60	251	252	253	254	255	256	257	258	259	260
61	62	63	64	65	66	67	68	69	70	261	262	263	264	265	266	267	268	269	270
71	72	73	74	75	76	77	78	79	80	271	272	273	274	275	276	277	278	279	280
81	82	83	84	85	86	87	88	89	90	281	282	283	284	285	286	287	288	289	290
91	92	93	94	95	96	97	98	99	100	291	292	293	294	295	296	297	298	299	300
101	102	103	104	105	106	107	108	109	110	301	302	303	304	305	306	307	308	309	310
111	112	113	114	115	116	117	118	119	120	311	312	313	314	315	316	317	318	319	320
121	122	123	124	125	126	127	128	129	130	321	322	323	324	325	326	327	328	329	330
131	132	133	134	135	136	137	138	139	140	331	332	333	334	335	336	337	338	339	340
141	142	143	144	145	146	147	148	149	150	341	342	343	344	345	346	347	348	349	350
151	152	153	154	155	156	157	158	159	160	351	352	353	354	355	356	357	358	359	360
161	162	163	164	165	166	167	168	169	170	361	362	363	364	365	366	367	368	369	370
171	172	173	174	175	176	177	178	179	180	371	372	373	374	375	376	377	378	379	380
181	182	183	184	185	186	187	188	189	190	381	382	383	384	385	386	387	388	389	390
191	192	193	194	195	196	197	198	199	200	391	392	393	394	395	396	397	398	399	400

FREE PRODUCT INFORMATION

05L

Reader Service: To receive more information on the products advertised in this issue of Radio Fun circle appropriate number. Please allow 6 weeks for processing of inquiry. Offer valid in the U.S. and possessions only.

Ham it up this Holiday!

☐ YES! Send me 1 year (12 issues in all) of 73 for the low price of $19.97!
(Save over $15.00 off the cover price) Mail this postage paid card today.
For instant service call toll free: 800-289-0388 (In CO., call 303-447-9330).

Name (please print) Call

Address

City State Zip

☐ Payment enclosed ☐ Bill me
Charge my: ☐ MC ☐ Visa ☐ Amex

Card Number Exp. date

4QHW4

Newsstand rate $35.40. Basic subscription rate $24.97 (Canadian orders add $7.00 per year plus $1.40 GST; other foreign countries add $19.00 per year for surface mail, $42.00 per year for airmail. Please allow 4-6 weeks for delivery of first issue.

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO 211 MANCHESTER NH

POSTAGE WILL BE PAID BY ADDRESSEE

Radio Fun

PO Box 4926
Manchester NH 03108-9839

Place
Stamp
Here

Radio Fun

READER SERVICE MANAGEMENT DEPARTMENT
PO BOX 8708
BOULDER CO 80329-8708

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO. 1199 BOULDER CO

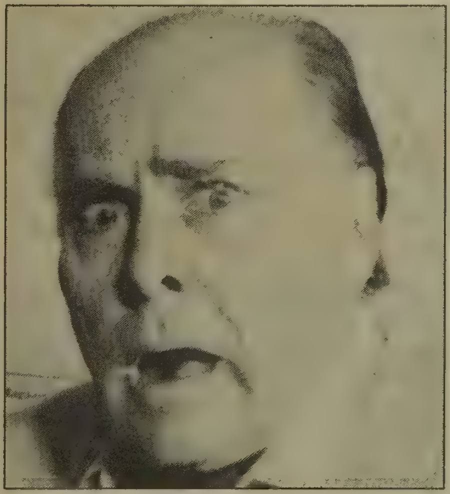
POSTAGE WILL BE PAID BY ADDRESSEE

73 Amateur Radio Today
P.O. BOX 50330
BOULDER CO 80321-0330

advertiser index

RS#	ADVERTISER	PG
18	A.S.A.	25
164	Ace Communications of Indianapolis	7
•	Advanced Electronic Applications	CV2
45	Amateur TV Quarterly	23
90	Antennas West	11
16	Astron Corporation	3
17	ATV World	11
105	Battery Tech, Inc.	10
184	C & S Sales, Inc.	25
157	Cabletech	20
252	D&D Cliff Dweller Antenna	13
130	Dandys	12
157	Echotrak	21
114	E. H. Yost	12
•	Electronic Distributors	30
•	Elktronics	24
•	EUR-AM Electronics	25
193	GGTE	21
72	Glen Martin Engineering	21
•	Handie-Base	16
179	Icom	CV4
293	Innotek, Inc.	29
240	Jan Crystals	16
2	Kawa Productions	21
234	Lentini Communications	13
274	M2 Enterprises	25
101	Maxcom, Inc.	12
86	MFJ Enterprises	5
162	Michigan Radio	22
98	Microcraft Corporation	20
221	Milestone Technologies	23
114	Mr. Nicad	12
21	N4ZDU Shareware	27
91	National Tower Co.	26
290	Nye Engineering	25
•	Oklahoma Comm Center	21
172	Optoelectronics	19
•	P.C. Electronics	16
152	PacComm	17
68	Periphex	11
132	Quement Electronics	27
110	Radio Amateur Satellite	24
•	Radio Fun	17
34	Ramsey Electronics	13
32	Ryan Communications	25
229	S. Douglas RF Devices	20
153	Satellite City	14
•	Sign On	14
238	Software for Amateur Radio	20
244	Software Systems	13
250	Software Systems	23
97	Spread Spectrum Scene	20
247	Startek	15
93	Tejas RF Technologies	21
119	Tiare Publications	20
269	Tigertronics	27
299	Townsend Electronics	16
11	Transel Technology	20
50	Tropical Hamboree	23
136	Unadilla Antenna Manufacturing Company	11
•	Uncle Wayne's Bookshelf	29
•	Universal Radio	29
•	Vanguard Labs	11
70	Vectronics Corporation	9
14	VHF Communications	21
104	Vis Study Guides, Inc.	29
•	Yaesu Electronics Corporation	CV3

What are you . . . nuts?



Our founder, Wayne Green W2NSD, upon hearing that you were not yet subscribing to *Radio Fun*.

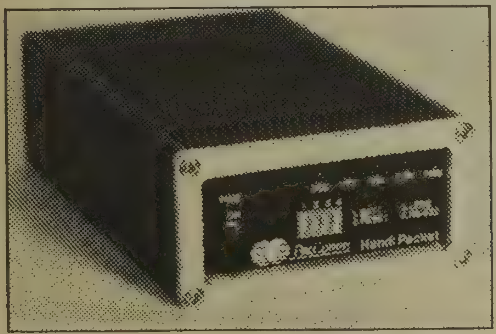
I'm shocked! I'm outraged! I'm beside myself and I'm flabbergasted!

You mean to tell me that *Radio Fun* has been around for a whole year, and you *still* haven't subscribed?

Even though you're aware that *Radio Fun* is the *only* amateur radio magazine devoted to the newcomer? Even though we pack every issue of *Radio Fun* with easy construction projects, interesting news, great reviews of new and vintage gear . . . not to mention our columnists, who are devoted to helping you learn more about, and have more fun with, amateur radio?

OK. We'll just forget your past indiscretions and start fresh. We'll send you 12 issues of *Radio Fun* for the amazingly generous price of $12.97. Hey . . . that's almost 1/2 off the cover price! Just use the convenient postcard attached to the center of this magazine, or you can call toll free, 1-800-257-2346, and charge your subscription. Either way, let's get this taken care of.

1 year of *Radio Fun* for only $12.97! Call 1-800-257-2346.



PacComm

- Advanced Technology
- Enduring Value

4413 N. Hesperides St., Tampa, FL 33614-7618
(813) 874-2980 Fax: (813)872-8696 (800)486-7388

HandiPacket PORTABLE PACKET CONTROLLER

"One of PacComm's Handipackets is
Aboard the MIR Space Station
Listen for U2MIR on 145.55 MHz"

Leading Provider of Packet Equipment for Amateur Radio

Get a beginner's packet setup, for only $65!
A serial port modem for your PC and a 'software TNC' diskette
Simply plug into the PC serial port and connect to your radio
Order BayMod-9 or Baymod-2

CIRCLE 152 ON READER SERVICE CARD

upgrade don't stop now

by Gordon West WB6NOA

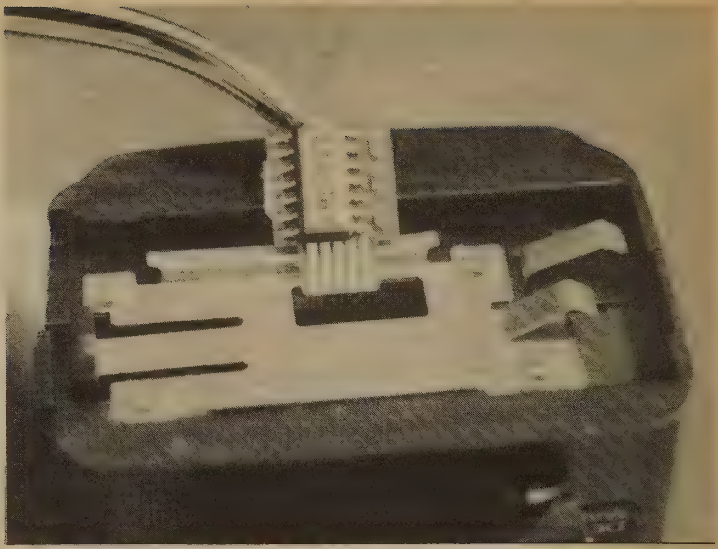


Photo B. Some handhelds have plug-in chips that give you up to 200 memory channels.

Your 2 Meter Handheld: Learning Things They Don't Tell You in the Book!

After you pass your ham test, it takes approximately six weeks for the Federal Communications Commission to issue your license. You studied long and hard to pass that entry-level exam—don't stop your studying now. Begin to learn how to use your new radio equipment, your 2 meter or dual-band handheld.

Most beginners start out with a hand-held transceiver. This plugs you into the mainstream of ham radio activity. You will be on the air with all grades of amateur radio operators—from no-coders all the way to Extra class.

You don't need to have a license in hand to purchase your new handheld, but it's always a good idea to tell the sales personnel that you have just passed the test and want to get started on programming your new equipment ahead of time for the local repeaters. That way, when your callsign finally arrives, you can go on the air instantly.

One of the first questions most sales personnel are asked is, "Which handheld is the best?" THEY ARE ALL GOOD—EACH COMPANY HAS EQUIPMENT THAT YOU NEED. SEE HOW IT FEELS, LISTEN TO THE AUDIO, AND LOOK OVER THE FREQUENCY DISPLAY, KNOBS, AND PUSHBUTTONS. If you can get your hands on a good variety of equipment for sale, you'll end up with a unit that is "best" for you. And as you look over the selection, don't forget to consider those "accessories" that are essential for a complete hand-held station:

Higher capacity, medium voltage, additional battery pack.

Rapid charger for the included, and additional, battery packs.

Speaker microphone for mobile operation.

Mobile battery charging unit.

External mobile antenna with simple lip mount.

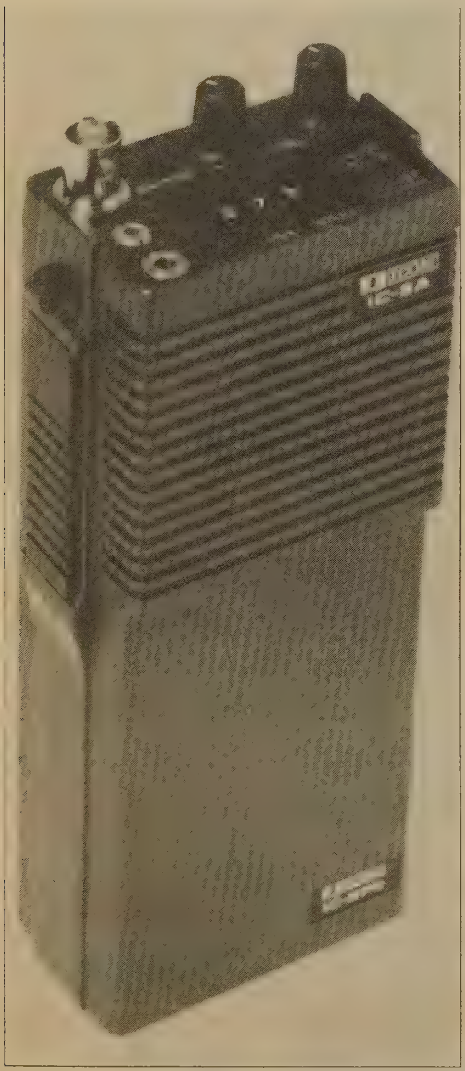


Photo A. Frequencies are entered with thumb wheel switches on the ICOM 2AT.

When you get your equipment home, charge up the battery that comes with the set using the trickle charger that is included with the handheld. If you purchased an additional battery, fast-charge it using the optional fast-charger. Most batteries are not charged when sold, so you will need to start out with a fresh pack. This means you can't turn your unit on for a couple of hours after getting it home.

While you're waiting for your batteries to charge up, look over that local frequency directory that lists the popular repeaters in your area. Here are the most common channels you will want to store in your memory channels:

146.940	- 600
146.820	- 600
146.880	- 600
145.410	- 600
146.910	- 600
146.970	- 600
147.030	+600
147.060	+600
146.850	- 600

These are the most common repeater assignments throughout the country. Even though some of these repeaters may require CTCSS (you will soon learn about this), you can still monitor these frequencies while your license is coming. This will help increase your operating skills even before you finally get on the air.

If a channel is a "repeater" frequency, you always dial in the frequency (listed in the directory) which is the repeater "output." You must also SET your transceiver for a plus or minus 600 kHz offset. Your local repeater directory will indicate most of the repeaters as a minus ("-") offset, except for those repeaters tuned in at 147 which may have a plus ("+") offset. The offset is similar to the separation between your telephone mouthpiece and earpiece—you talk in one spot and listen in another. Unless you program a plus or minus sign on your handheld's display, you won't be able to access the repeater.

Some repeaters may also require a published tone in order to turn them on. You normally can't hear these tones, but the repeater can. Unless you have the proper tone ENCODED, you will be able to hear the repeater but the repeater won't pass your transmission when your license finally arrives and you go on the air.

Local users may call their tone by its actual frequency in hertz, yet others may simply refer to the tone as a number/letter combination. The conversions are shown in Table 1.

Finally, You're On The Air!

When your license arrives, you will be tempted to use high-power output for your first communications. Try low-power output first. This dramatically increases how long you can stay on the air with the portable battery pack. If you are

Photo C. Newer HTs have LCD readouts that come in varying sizes.

Photo D. Each of the newer hand-held radios has its own unique programming sequence you will need to learn.

using an external mobile antenna, low power will be fine. If you are located within 20 miles of the repeater, low power will also be just dandy for your little rubber antenna. If you want to increase your range, go to a telescopic whip or an external antenna system for big results. Switching from 1 watt output to 3 watts output makes little difference on how far away you might communicate.

If your set should all of a sudden quit transmitting and receiving, and you know your battery is fresh, double-check that "APO" is not showing in the little LCD window. If it is, follow the instructions to disable "APO." "PO" is automatic power off, and it shuts your handheld off after 30 minutes, 45 minutes, or maybe 60 minutes after turn-on. Unless you're absent-minded, keep this feature off.

When your license arrives, find a buddy to start transmitting and receiving with over "simplex," such as 146.520 MHz. No plus or minus should be showing in the window—simply the letter "S" for simplex. Simplex lets you talk direct, and this way you can get started on ham radio without first going on a repeater.

Once you have refined your operating techniques, meet your friend on a local repeater during periods of non-activity. In other words, don't start your testing during morning or evening rush hour where the repeater may be tied up with traffic reports.

Talk plain language, and be courteous. Don't interrupt repeater conversations already in progress, and stay away from the word "break," which is generally reserved for priority traffic. As a newcomer to ham radio you want to easy in on your new privileges and not start out like a shot out of a cannon. Let people know that you are on the air for the first time and politely ask when the next club meeting is so you might attend and join in on the activities. Club meetings are a great way to let other hams with the same equipment help you program additional frequencies into your new handheld transceiver.

Stay away from CB slang such as "breaker," "good numbers to you," "seventy-thirds," and "catch you later, good buddy." The way to get started properly in ham radio is to BLEND IN.

Hand-Held Transceivers

Manufacturers of 2 meter handheld transceivers are getting back to basics. One of the most simple sets to operate was the ICOM 2AT (Photo A). It had no memory channels, and repeater offset was accomplished by sliding a little switch from plus to minus. It was ridiculously simple, and folks like Alinco are bringing back this same simplicity with their newly announced DJ-180 hand-held transceiver (I have operated this one successfully without even cracking the book). And once you master this tiny unit and want more features, you can plug in up to 200 additional channels with just a little tiny chip that pushes in and out for instant mega-memory (See Photo B).

So don't let any salesperson tell you which is the best handheld for you until they find out what you need as a portable communications set. Let them give you several different models to play around with in the store. Find the one that feels best, looks best, and sounds best, just for you. Then buy it, wait for your license to arrive before transmitting, but use the heck out of it on receive while you're waiting for your FCC ticket to arrive in the mail. Once you get on the air, that's when good ham radio operating techniques are developed. Passing the licensing test is only a fraction of becoming a good ham radio operator.

Hear you on the air! RF

67.0—XZ	97.4—ZB	141.3—4A	206.5—8Z
69.3—WZ	100.0—1Z	146.2—4B	210.7—M2
71.9—XA	103.5—1A	151.4—5Z	218.1—M3
74.4—WA	107.2—1B	156.7—5A	225.7—M4
77.0—XB	110.9—2Z	162.2—5B	229.1—9Z
79.7—WB	114.8—2A	167.9—6Z	233.6—M5
82.5—YZ	118.8—2B	173.8—6A	241.8—M6
85.4—YA	123.0—3Z	179.9—6B	250.3—M7
88.5—YB	127.3—3A	186.2—7Z	254.1—0Z
91.5—ZZ	131.8—3B	192.8—7A	
94.8—ZA	136.5—4Z	203.5—M1	

Table 1. Repeater conversions. (Table courtesy of the ARRL.)

ELIMINATES SEARCHING, SCANNING, TUNING
INTERCEPTOR™

INTERCEPT, DETECT & CAPTURE
Near Field Transmissions with
Optoelectronics' New
INTERCEPTOR™

NEW
TECHNOLOGY

- Follows & Locks on even when frequency changes.
- Intercepts *ALL* FM Two-Way Transmissions without gaps in coverage.
- *Does Not* have to tune through RF Spectrum to find signals.

FCC Classified as Communication Test Instrument for:

- Deviation, FM, FMN
- Relative Signal Strength
- Signaling Tones (CTCSS)
- Modulation Monitor
- Great for testing VHF, UHF & Cellular transmitters

A New Dimension in Recreational Monitoring – Intercept the Two-Way Communication that Surrounds You.

Increase Your RF Security.

Hand Held/Shirt Pocket Size

MADE IN THE U.S.A.

INTRODUCTORY OFFER
Interceptor™ R10 FM Communications Interceptor (Includes NiCads, AC/Charger Adapter, Antenna, Earphone) .... $359.

OPTIONS
Headphones (Lightweight personal headphones) .... $ 15.
Antenna Pak 2 (Five assorted rubber duck antennas – save $32.) .... $ 99.
TC200 Tone Counter (CTCSS signalling tones) .... $ 179.
APS-104 (Extends RF detection distance 10x) .... $ 995.
CF800 Cellular Band Pass Filter/Amplifier .... $ 299.

OPTOELECTRONICS
FACTORY DIRECT ORDER LINE 1-800-327-5912
305-771-2050 • FAX 305-771-2052 • 5821 NE 14th Ave., Ft. Lauderdale, FL 33334
5% Ship/Handling (Max$10.) U.S. & Canada. 15% outside continental U.S. Visa & Master Card accepted
CIRCLE 172 ON READER SERVICE CARD

the tech side

by Michael Jay Geier KB1UM

Sorry I've been away for a while. I've been in the process of moving and I just couldn't find the time to write. It's good to be back! This month, we're going to look at amplifiers and oscillators, the things that make our radios tick.

Without amplifiers, there would be no electronics as we know it. Nope, no radio, TV or stereo. What's that? You have a computer and it's all digital, so obviously it doesn't need amplifiers? Gotcha again: Digital gates *are* amplifiers. Without amplification, the best we could do would be to listen to Morse code, generated by spark transmitters, on crystal radios with earphones. And, of course, that's exactly what people did before the amplifier was invented.

In the Beginning . . .

As far as I know, the first device capable of amplifying a signal was the Audion tube, invented by Lee De Forest. That was a *long* time ago! Tubes, much refined, of course, continued to be used well into the 1960s, with some TV sets using them all the way into the early 1970s. Today, tubes are used only in very-high-power applications and at microwave frequencies currently unattainable with solid-state devices. For just about all other uses, the mighty semiconductor has swept the glass envelope away. Despite the tube's fading from common use into its specialized niche, it is still a useful thing to study because it is the simplest kind of amplifier ever invented.

What's To Gain?

When a circuit amplifies a signal, we say that the circuit has gain. But how can you make something from nothing? We all know that you can't actually create energy. Well, a signal is not a form of energy at all! It is the *change* in some energy, and we can take some more raw energy and make its changes follow those of the original signal. And that's what an amplifier really is: a modulator. But, instead of modulating an RF carrier, it modulates DC power from the power supply. Let's see how it works:

Open Up

An amplifier is like a valve. In fact, the British term for an amplifying tube actually is "valve"! Whether tube or transistor, the construction of an amplifying device follows the same scheme: two electrodes (connection points) separated by a third "control" element. In a tube, the two electrodes are called the cathode and anode. (The anode is also called the "plate.") The third electrode, which controls the flow of current, is called the grid. Actually, all three electrodes are nothing more than pieces of metal. What makes them behave differently from each other is their relative positions in the tube, along with how they are connected into the rest of the circuit.

In order to control the flow of electrons between the cathode and anode, some electrons have to be flowing in the first place! Unfortunately, they just won't do it on their own. Two conditions must first be met: First, there must be no air or other gas in the electrons' path or they will collide with the gas's atoms and stop. Second, they must be propelled in some way from the cathode or they will just sit there and go nowhere. The first condition is met by exhausting the air from the tube. But how do you propel electrons? Simple: You heat them up! Heating the cathode gives the electrons enough energy so that some of them can escape the atomic forces which normally hold them to the cathode. That's why tubes have filaments not unlike those in light bulbs. These, however, are designed to produce more heat than light. (That's why you don't want to touch a tube after it's been on for a while. Those things get *hot.*) Once the electrons are loosened and ready to go, a positive charge placed on the anode actually attracts them across the space in the tube. As they travel, the attraction makes them pick up speed. When they smash into the plate, they complete the circuit through the tube.

Halt, Who Goes There?

The grid is kind of like a crossing guard. Placed closer to the cathode than to the plate, the grid can be made to either attract or repel the passing electrons, depending on whether a positive or negative charge is placed upon it. By charging it with the small incoming signal you wish to amplify, you can make it control the flow of electrons across the tube in step with the signal. The real trick is that, because it is closer to the electrons' source (the cathode), the grid can work on those electrons *before* they get attracted

Spread Spectrum Scene

Happy Holidays!

Learn About the Exciting World of PCS, LANs, Digital Cellular, TDMA and CDMA.

Happy Holidays!

Tune in to Wireless LANs, MANs, WANs, PCNs, digital comm, CDMA systems and amateur radio spread spectrum:

- New products
- Construction Articles
- Tutorials
- Regulatory News
- Columns on: Antennas, DSP, Networking Software, Secret Signals & Technical Education

Holiday Special! 15 Issues only $29.95 US/$45.00 Foreign

Free sample issue: $.75 postage on 9" x 12" SASE

RF/SS, P.O. Box 2199, El Granada CA 94018

SUBSCRIPTIONS: 800-524-9285

MasterCard VISA

CIRCLE 97 ON READER SERVICE CARD

SATELLITE T.V.

Factory Direct to Your Door

Echostar • Startrak • Houston Tracker • Orbitron

24 Hr. Pricing Hotline 516-763-6842

- Call for FREE Huge Color Catalog
- Domestic & International Systems
- Huge Savings!

Info & Orders

ECHOTRAK™ 305-344-6000

4749 NW 98th Lane • Coral Springs, FL 33076

CIRCLE 157 ON READER SERVICE CARD

The Choice Is Yours!

CODE SCANNER OR CODE STAR

✓ MORSE
✓ RTTY
✓ ASCII
✓ SPEAKER
✓ CPO

Made In USA

CODE SCANNER - compact, lightweight, 32 character LCD display. $189. S&H $6.

CODE STAR - 8 large easy-to-read LEDs. Kit $139. Wired $179. S&H $6. (Optional ASCII Output Port Available.)

Free Brochure. Call-Write-Order. MC/VISA.

Microcraft Corporation

Box 513RF, Thiensville, WI 53092

Phone (414) 241-8144

CIRCLE 98 ON READER SERVICE CARD

SELL YOUR PRODUCT
IN *73* CALL
SUE COLBERT
OR DAN HARPER
800-274-7373 TODAY!

2 Meter Performance!

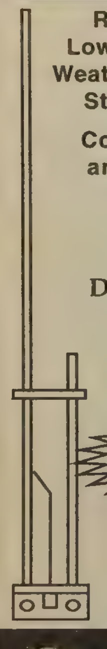
The J Antenna!

REAL GAIN! 2.9 dBd
Low SWR! Less than 1.5:1
Weatherproof Aluminum and Stainless construction.

Comes fully assembled and tuned for fast and easy installation.
Made in USA!

Also available
Doppler RDF units $450

Add $4.50 for shipping and handling.
COD orders welcome.



"Makes A Great Holiday Gift"

S. Douglas RF Devices
P.O. Box 246925
Sacramento, CA 95824
(916) 688-5647

Only $27.50

CIRCLE 229 ON READER SERVICE CARD

Basic Packet Radio
By
Joe Kasser, W3/G3ZCZ

Contains 380 pages that describe:-

What packet radio is. What it takes to use it. The Local Area Network (LAN). The Packet Bulletin Board System (PBBS) and how to use it. How to Send and Receive Messages & Bulletins. The distributed LAN. Extending your range via Nodes. PacketClusters. Servers: Dumb and smart. ELMER - The ham's expert system. LAN-LINK manual and evaluation disk.

PRICE $29.95 add $2.00 S & H.

Try it for 30 days. Money cheerfully refunded if you are not satisfied. Send check (US Bank) or money order (state disk size) to:-

Software For Amateur Radio, #200
POB 3419, Silver Spring
MD. 20918
(Overseas, add $6.00 for airmail)

CIRCLE 238 ON READER SERVICE CARD

GREAT RADIO READS!

TIARE

PSE QSL - ***An Expert's Guide to Amateur Radio QSL'ing*** $ 9.95

Ham Radio Contesting
the thrills 'n chills $14.95

The RV Antenna Manual
antennas for your RV.......... $14.95

World Ham Net Directory
over 900 nets....................... $ 9.95

$ U.S. only.
Add $2 s/h ($3 foreign) plus
$1 each additional book.
VISA/Mastercard welcome.
Catalog $1 (free with order).

Order Now
Tiare Publications
P.O. Box 493
Lake Geneva, WI 53147

CIRCLE 119 ON READER SERVICE CARD

Isn't Your Radio Worth The Investment?
Protect It With

THE PACK-IT
FROM TRANSEL TECHNOLOGIES

TRANSEL TECHNOLOGIES

Protect your HT's, Cellular Phones, Pagers, and any other devices you carry that may be subject to damage.

The PACK-IT is made of 1/4" neoprene material which is safety belt sewn to the nylon protective backing. The PACK-IT doesn't frey like many other materials and is safe to wash whenever needed.

The strap and 2" beltloop is made from commercial grade webbing and is secured in the front with a Velcro hook and loop assembly.

The PACK-IT doesn't wear the radio like leather and protects the radio from the small falls which occurs in everyday usage. The neoprene material is a cushion material which not only covers the radio but also protects it. Various sizes available so call for the size to fit your need.

Made In The USA!

$15.95 + $3.00 S&H

1 (800) 829-8321

Dealers Welcome

CIRCLE 11 ON READER SERVICE CARD

with much force to the plate. So, the small incoming signal can control the flow of electrons that ultimately will have increased energy. The result is that the small signal modulates (changes) the DC power flowing through the tube into a bigger but faithful replica of itself. And that, folks, is amplification!

A Solid Alternative

In a transistor, the three elements are layers of silicon material. The physics is hairy, but the effect is the same: One element controls the flow of electrons between the other two. Because the electrons are moving through a somewhat conductive (semiconductive) solid material, though, they don't need to be propelled with heat; deliberate chemical impurities in the layers of the transistor create "holes," or areas of missing electrons, in the semiconductor's crystal structure, and the electrons travel across the material by fitting into the holes. In that seemingly convoluted way, the positive charge at the other end attracts the electrons to it, just like it does in the tube! Without the filament, though, the transistor can remain much cooler than a tube. In fact, all of the heat generated by a transistor is caused by its resistance to the flow of current. In other words, it's a side effect, not an intentional characteristic.

Calling All Signals

OK, so now we know how we can make a small signal bigger. But where do we get the signal from in the first place? Well, it could come from a microphone, a tape head, or perhaps an antenna. If it comes from an antenna, though, it has to be generated by a transmitter, right? And where does that transmitter get it from?

What Goes Around . . .

Radio-frequency signals can be generated in many ways, but the common modern method is to use an oscillator. If you've ever watched a violinist, you've seen how steady "DC" power (the pull of the bow) can be transformed into rapid back-and-forth, or oscillating, motion (the vibration of the string). But how do we make electricity do that?

It turns out to be rather simple. All we have to do is feed some of an amplifier's output signal back to its input. Random electrical "noise" in the amplifier causes small changes in the output signal. Those changes get fed back to the input, where they cause even bigger changes. Those go back around again and . . . well, you get the idea. It keeps going around and around and that's oscillation.

Upside Down

Well, almost. If the amplifier produced an output exactly like its input, the output of the "oscillator" would just get as big as it could and then sit there; it would not actually oscillate. Amplifiers can, however, be designed to invert signals. That is, as the input signal gets bigger, the output gets smaller, and vice versa. So, the output is a replica of the input, only upside down. If you feed the inverted output back to the input, it then reinverts the output, which inverts the input, and so on. The result is that the output swings back and forth, and that is true oscillation.

Doing the Speed Limit

It might seem that it would all happen so fast that it would be uncontrollable. In fact, the speed at which the oscillator runs is dictated by how fast the electrons can make the trip all the way around, and there are ways to slow them down as much as you want. By changing the apparent length of the circuit, we can tune the oscillator to a specific frequency in exactly the same way the violinist does when he or she changes the length of the strings with finger pressure.

Please notice that I said the *apparent* length. You don't actually have to add more wire, although that will work. Unfortunately, because electricity moves so very fast, it would take an awful lot of wire before you'd notice the change. Instead, you can add capacitance to slow things down.

Charge It

A capacitor is just two electrodes with an insulator in between. Anything from plastic to air will work as the insulator. When you put a charge across it, the capacitor stores some of that charge. The more charge it can store, the bigger its capacitance.

If you put a capacitor in an oscillator's circuit, you force the circuit to charge the capacitor during the electrons' trip. The bigger the capacitance, the more time it takes to do this. It's a kind of detour, and it results in the oscillator's running slower because the electrons can't get to the other side until the capacitor is charged. And why did the electron cross the circuit? To get to the other side, of course.

Ouch! On that bit of attempted humor, let's call it quits for this month and pick this up again next time. But before we go, let's look at a letter:

Dear Tech Side,

For my base station, I use a mobile 2 meter rig with a power supply. I haven't had a chance to put an antenna up on the roof yet, so I just plopped my mobile magnetic mount antenna on top of the power supply. I can hit all the local repeaters just fine, but everybody complains that there's a buzz in my audio. In the car, the radio works fine. Where's that buzz coming from?

Signed,
Buzzed Off

Dear Buzzed,

The RF output signal from your transmitter is getting back into your power supply. Get that antenna off of there! Don't put it on top of the radio, either. Put it as far away as possible from the rig and supply. Also, remember that 1/4-wave and 5/8-wave mobile antennas (the most common kind) require a ground plane, which normally is the body of your car. Unless you have a big metal desk, these antennas really are not suitable for indoor use. Put up your outdoor antenna and the buzz should go away. Also, try to keep the leads going from your power supply to the radio as short as possible, and avoid lengths around 19 or 38 inches because they can resonate on the 2 meter band and cause problems. Good luck!

73 'til next time from KB1UM. RF

Backpacker II
CW Transceiver Kit
Tejas RF Technology's **Backpacker II** has the many great features of the Backpacker I ...Plus! We incorporated the Mini-Circuit Lab's TUF-1 miniature doubly balanced diode ring mixer, and we have newly redesigned the preamplifier, AF low pass filter, dual section CW filter, and audio amplifier sections. The **Backpacker II** is available for 80, 40, 30, 20, or 17 meters.
$159.95 + shipping & handling
Write or fax for more information.
Tejas RF Technology
17 South Briar Hollow, Suite 101
Houston, Texas 77027
telephone 713-840-8600; fax 713-840-8608
CIRCLE 93 ON READER SERVICE CARD

MORSE CODE MUSIC?
New-Powerful-Breakthrough, All 43 Morse Code characters sent with a rhythmic beat. A fun & easy way to learn or retain Morse Code skills. Now the secret is yours! order "THE RHYTHM OF THE CODE"™ Version II cassette today!
Send $9.95 and we'll pay the shipping to:
KAWA PRODUCTIONS
P.O. Box 319-RF.
Weymouth, MA 02188.
Check or money order only. We ship all orders within 10 days. Outside U.S.A. please add $2. for air mail. MA residents please add 5% sales tax.
CIRCLE 2 ON READER SERVICE CARD

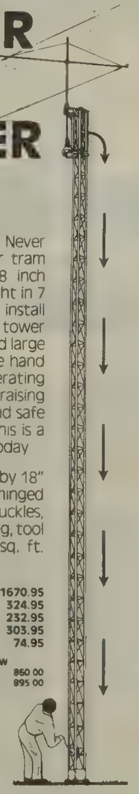
VISA MasterCard
ICOM
Listen to
"Let's Talk Radio"
7 nights a week
6pm to 12 pm on
Spacenet-3,
Transponder-21,
Audio 6.2
VHF
COMMUNICATIONS
9:00 am – 5:30 pm
weekdays
Weekends and evenings
by appointment.
280 Tiffany Avenue
Jamestown, New York 14701
Western New York's finest amatuar radio dealer.
PH. (716) 664–6345
(800) 752–8813 for orders only
CIRCLE 14 ON READER SERVICE CARD

Oklahoma
Comm
Center
ALINCO ICOM YAESU
SPECIAL SPECIAL
CALL
For This Month's Special-Buy
Some Quantities Are Limited
FREE SHIPPING UPS SURFACE
(on purchases of $50.00 or more except antennas)
VISA MasterCard DISCOVER C.O.D.
3900 S. Broadway, Suite 6
Edmond, Oklahoma 73013
Local & Info (405) 359-9554
Fax (405) 359-9556
CALL TOLL FREE
1-800-70K-HAMS
1-800-765-4267
Hours of Operation
M-F 10-6
Sat 10-2
Showroom closed Mondays

NEED HELP?
GRAB THE LINE
Call our lifeline.
It's toll-free.
THE VOICE OF HOPE
1-800-572-1717
MDA®
Muscular Dystrophy Association

SRC-10
REPEATER/LINK
CONTROLLER

DTMF muting
Intelligent ID'er
Auxiliary outputs
Easy to interface
Alarm monitor input
Telemetry response tones
Low power CMOS, 22ma @ 12v
Detailed application manual
Programmable COS polarities
Repeater & link courtesy tones
Synthesized link/remote base capability
$149.00 *Assembled & Tested*
CREATIVE CONTROL PRODUCTS
3185 Bunting Avenue
Grand Junction, CO 81504
(303) 434-9405
MasterCard VISA
CIRCLE 146 ON READER SERVICE CARD

Enjoy NEVER
CLIMBING
YOUR TOWER
AGAIN

Are you too scared or too old to climb? Never climb again with this tower and elevator tram system. Voyager towers are 13 and 18 inch triangular structures stackable to any height in 7 1/2', 8 3/4' or 10' section lengths. Easy to install hinge base, walk up erection. Next plumb tower with leveling bolts in base. Mount rotor and large heavy beams on Hazer tram and with one hand winch to top of tower for normal operating position. Safety lock system operates while raising or lowering. At last a cheap, convenient and safe way to install and maintain your beam. This is a deluxe tower system that you can enjoy today

SPECIAL TOWER PACKAGE: 50 ft. high by 18" face tower kit, concrete footing section, hinged base, HAZER kit, Phillystran guy wires, turnbuckles, earth screw anchors, 10' mast, thrust bearing, tool kit, ground rod and clamp, rated at 15 sq. ft. antenna load @ 100 MPH, **$1974.95.**

50' by 13" wide tower, same pkg as above	$1670.95
HAZER 2 for Rohn 25-hvy duty alum 12 sq ft wind ld	324.95
HAZER 3 for Rohn 25-std alum 8 sq ft wind load	232.95
HAZER 4 for Rohn 25-hvy galv stl 16 sq ft wind ld	303.95
TB-25 Ball thrust bearing, 2½" max mast dia.	74.95

NEW NEW NEW NEW NEW NEW

HAZER VH 8 Transit System for Rohn 45 22 sq ft wind load	860 00
HAZER VH 9 Transit System for Rohn 55 22 sq ft wind load	895 00

Satisfaction guaranteed. Call today and order by Visa, M/C or mail check. Immediate delivery.

Glen Martin Engineering, Inc.
Dept. A
RR 3, Box 322,
Boonville, MO 65233
816-882-2734
FAX: 816-882-7200
GM GLEN MARTIN ENGINEERING
CIRCLE 72 ON READER SERVICE CARD

SCARED OF THE CODE?
IT'S A SNAP WITH THE ELEGANTLY SIMPLE MORSE TUTOR ADVANCED EDITION FOR BEGINNERS TO EXPERTS—AND BEYOND

Morse Code teaching software from GGTE is the most popular in the world—and for good reason. You'll learn quickest with the most modern teaching methods—including Farnsworth or standard code, on-screen flashcards, random characters, words and billions of conversations guaranteed to contain every required character every time—in 12 easy lessons.

Sneak through bothersome plateaus in one tenth of a word per minute steps. Or, create your own drills and play them, print them and save them to disk. Import, analyze and convert text to code for additional drills.

Get the software the ARRL sells and uses to create their practice and test tapes. Morse Tutor Advanced Edition is approved for VE exams at all levels. Morse Tutor is great—Morse Tutor Advanced Edition is even better—and it's in user selectable color. Order yours today.

For all MS-DOS computers (including laptops).
Available at dealers, thru *QST* or *73* or send $29.95 + $3 S&H (CA residents add 7.75% tax) to:
GGTE, P.O. Box 3405, Dept. MS,
Newport Beach, CA 92659
Specify 5¼ or 3½ inch disk
(price includes 1 year of free upgrades)
CIRCLE 193 ON READER SERVICE CARD

try something new

by Bill Brown WB8ELK

Nets

One of the appealing things about ham radio is the wide variety you find within the hobby. Wouldn't it be great to be able to meet others on the air who share your particular interests?

Fortunately there is a way—it's called a *net*. A net is a group of hams who meet regularly on a certain frequency at a given time. The frequency of a net depends on the coverage area that it's intended to cover. For local nets, a simplex frequency or repeater on the VHF/UHF bands will usually suffice. Due to the predictability of coverage, the 75 meter phone band is usually a good (and popular) choice for many nets that want to cover a wide region. International nets usually operate in the 20 meter band. A number of nets occur on the Novice 10 meter band as well.

Formal Nets

A formal net (no, you don't have to dress up) is moderated by a *net control* operator who essentially controls the flow of the communications. All stations who check into a formal net must first talk to the net control station. The net control station then asks the "check-in" station for their request. This kind of net activity allows you to make announcements, ask questions of the general net audience, contact someone who may be listening, or relay information.

If you're looking to contact a specific station on frequency, the net control will allow you to establish contact with the station. If the net is large, it's usually expected that the two of you will move off the net frequency while the net continues.

Formal nets usually involve a large group of stations. Nets for passing traffic, announcements of upcoming activies, chasing or operating DX, swapping used equipment, and weather and emergency nets are all usually operated in a formal manner.

Emergency Nets

Some nets are activated only in times of emergency. Some examples are in the case of hurricanes, tornadoes, earthquakes or other disasters. These nets are very formal in nature and involve the passing of health and welfare messages, the logistics of getting needed supplies to a stricken area and relaying damage reports. Emergency nets usually work closely with the state and local authorities and help out whenever needed. Usually the participants agree to meet on a particular frequency whenever needed.

Traffic Handling Nets

Some nets are dedicated to passing along messages from the general public. These meet at specific times and frequencies and involve passing messages (called traffic) through a network of participating groups until they reach their final destination. Most activity is either via phone or CW.

Round Tables

Whenever three or more hams start a conversation on any frequency, they form a *round-table* discussion (some nets quickly drop into this format after getting things started). This is a very informal discussion that works well with a small group. You basically just give your comments to the group and hand it over to someone else in the group. This is similar to forming a group into a circle and passing a basketball around. Whenever you have the ball, you get to talk!

A regular contact can quickly turn into a round-table discussion. If you're in QSO with someone and start talking about an intriguing topic, you may find that you've formed a round-table discussion as others break into your conversation. I once started discussing UFOs with a W7 station and ended up with a round-table discussion involving over a dozen stations in under 20 minutes. I left for dinner and returned to the frequency two hours later. I was surprised to hear the UFO round table continuing as more hams joined the lively discussion.

Calling Frequencies

A calling frequency is one alternative to a net. It's an announced frequency where others of similar interests monitor. You may listen to a calling frequency for hours with absolutely no activity, but if you give a call on the frequency you may get deluged with responses! Some calling frequencies are very local in nature, others are known nationally (or internationally). One example of a calling frequency is 146.52 MHz. This is the national calling frequency on 2 meters. Whenever you travel into a new area, you're likely to raise someone by giving a call on this frequency. An HF example is the 6 meter band opening calling frequency (it's not on the 6 meter band). Whenever someone hears a good band opening on the 6 meter band, they give out a call on 28.885 MHz to alert the group.

A Net for Everyone

There's a net that supports your particular interest, whether its chasing DX, operating digital modes (CW, RTTY, packet, etc.), disaster communications support, weather watching, ATV/SSTV or operating on the satellites. I think you'll find net operation to be an integral part of ham radio. I've included a small list of some of the nets I find intriguing.

A book that lists most HF nets that meet regularly is *The World HAM NET Directory* by Mike Witkowski. It's available from Uncle Wayne's Bookstore (cat. no. 09D22) at (800) 234-8458. The ARRL also offers a source of net information (updated annually) called *The ARRL Net Directory*. **RF**

Some Selected Net Frequencies (all frequencies in MHz)

AMSAT	3.840	Tues., 9 p.m. local (East and Mid-America), 8 p.m. (West)	Information about amateur satellites.
ATV (Midwest/East)	3.871	Tues., 8 p.m. EST	Announcement/discussions about amateur television.
ATV (West)	7.243	Sun., 10 a.m. Pacific	Amateur television.
CQ All Schools Net	28.303	Tues./Thurs., 12:30 p.m. Eastern	A great meeting place for school groups.
10-10 International Net	28.800 and 28.380	Daily, except Sun., 1800 UTC	Promoting 10 meter activity.
IOTA	28.555	Sat., 1300 UTC	Islands On The Air, participants meet to work new islands.
QRP SSB/CW	28.322 (or 7.285)	Thurs., 0300 UTC; Sat., 1900 UTC	QRP sideband or CW operation.
SSTV	14.230	Sat., 1800 UTC	Slow-scan TV.
UFO/ET Discussion Net	3.930	Thurs., 8:00-11:30 p.m. Eastern	Extra-terrestrial communications and the UFO phenomena.

Calling Frequency Examples

ATV (Midwest)	144.340 MHz	QRP	3.560 MHZ
EASTCARS and WESTCARS	7.255 MHz		7.030 (or 7.040) MHz
Fireball QRP (50 milliwatts or less)	28.060 and 28.322 MHz		14.060 MHz
Maritime Mobile	14.313 MHz		28.060 (or 28.322) MHz
MIDCARS	7.258 MHz	SSTV (Slow-Scan TV)	14.230 (or 14.233) MHz
National 2m Calling	146.52 MHz	6 Meter Band Opening	28.885 MHz

KENWOOD • LARSEN • MFJ • MIRAGE/KLM • RF CONCEPTS • TEN-TEC • YAESU • KENWOOD • LARSEN • MFJ • MIRAGE/KLM • RF CONCEPTS • TEN-TEC • YAESU

B & W • BENCHER • BUTTERNUT • CUSHCRAFT • • HYGAIN • ICOM • KANTRONICS •

Michigan Radio
SALES SERVICE
NEW ADDRESS
23040 Schoenherr, Warren, MI 48089
OPEN MON–FRI 10–6, SAT 10–4, SUN CLOSED

ORDERS 1-800-TRU-HAMM
IN-STATE 1-313-771-4711
SERVICE 1-313-771-4712
FAX SERVICE 1-313-771-6546

Call for our low prices

WANTED: QUALITY USED GEAR, CASH OR TRADE

TERMS:
Prices Do Not Include Shipping.
Price and Availability Subject to Change Without Notice
Most Orders Shipped The Same Day
COD's Welcome ($4.00 + shipping)

KENWOOD

HT'S

MODEL	DESCRIPTION
TH-225A	2M 5W SCANNG DEL
TH-28A	2M 2-5W MICRO 40ME
TH-48A	70CM 2-5W MICRO
TH-78A	2M/70CM DEL DUAL B

MOBILE VHF/UHF

MODEL	DESCRIPTION
TM-241A	2M 45W PROG MIC
TM-331A	220MHZ 25W PROG MIC
TM-441A	440MHZ 25W PROG MIC
TM-741A	2M/70CM/? TRIBANDER
TH-641A	2M 25W ALL-MODE
TS-790A	2M/70CM SATELLITE

HF EQUIPMENT

MODEL	DESCRIPTION
TS-140S	HF COMP GEN COV
TS-690S	HF/6M COMP GEN COV
TS-450S	HF DELUXE COMP
TS-450S/AT	HFDEL COMP TUNR
TS-850S	HF 12V DEL DDS
TS-850/AT	HF 12V DEL TUNR
TS-950SDX	HF THE DX MACHINE!

KENWOOD

ICOM

HT'S

MODEL	DESCRIPTION
IC-02AT	2M 5W 10MEM DTMF
IC-2GAT	2M 7W 15MEM DTMF
IC-2SAT	2M 2-5W DEL MICRO
IC-2SRA	2M/SCANNER HT
IC-24AT	2M/70CM DEL MICRO
IC-3SAT	220M 2-5W MICRO
IC-4SAT	70CM 2-5W MICRO
IC-4SRA	70CM/SCANNER HT
IC-4GAT	70CM 7W 15MEM DTMF
IC-W2A	2M/70CM DUAL MICRO

MOBILE VHF/UHF

MODEL	DESCRIPTION
IC-229A	2M FM, 25W 20MEM
IC-229H	2M FM, 45W 20MEM
IC-3220A	2M/70CM 25W 40MEM
IC-3220H	2M/70CM 45W 40MEM
IC-2410	2M/70CM 45W DEL

HF EQUIPMENT

MODEL	DESCRIPTION
IC-728	HF COMPACT GEN COV
IC-729	HF/6M COMP GEN COV
IC-735	HF DELUXE COMPACT
IC-751A	HF 12V BASE TXCR
IC-765	HF DELUXE TNR,PS
IC-781	HF DX'ERS DELIGHT

WE STOCK A FULL LINE OF ACCESSORIES
FOR THE ICOM LINES, CALL FOR OUR DISCOUNTED PRICES
1-800-TRU-HAMM

YAESU

HT'S

MODEL	DESCRIPTION
FT-411E	2M 2-5W 50MEM,CTCSS
FT-811	70CM 2-5W 50MEM
FT-470	2M/70CM 2-5W 50MEM
FT-26	2M-5W WITH/DTMS PAGING
FT-76	440MHz-5W WITH/DTMS PAGING
FT-415	2M 5W HT TXCR
FT-815	440 MHz 5W HT TXCR
FT-212RH	50W 2M COMPACT MOBILE

MOBILE VHF/UHF

MODEL	DESCRIPTION
FT-290RII	2M 25W ALL-MODE
FT-690RII	6M 10W ALL-MODE
FT-736R	2M/70CM 220//1 2 SAT
FT-5200	2M/70CM DUAL BAND
FT-6200	70CM/1 2 DUAL BAND
FT-2400H	2M 50W,LCD,CTCSS
FT-790RII	70CM 25W ALL-MODE

HF EQUIPMENT

MODEL	DESCRIPTION
FT-747GX	HF LGTWGT MOBILE
FT757GXII	HF COMP GEN COV
FT-767GX	HF 2//220//70C TUNR
FT-990	HF 12V DEL TUNR +
FT-1000B	HF BASIC VERSION
FT-1000D	HF QSL CATCHER!!
FT-890AT	HF DEL MOBILE DOS

YAESU

DIAMOND ANTENNA

MODEL	DESCRIPTION
NR-770H	2M/70CM 3/5 DB MOB ANT
NR-770R	2M/70CM 3/5 5 DB MOB
SX-100	100 M 1 6–60M 30/300/3kW
SX-1000	1000 M 1 8–160/-1300
SX-200	200 M 1 8–200M 5/20/200W
SX-400	400 M 140–525M 5/20/200W
SX-600	600 M 1 8–60/140–525 200W
X-200A	2M/70CM 8 3 H 6/8 DB
X-300	2M/70CM 6 5/9 DB
X-500A(N)	2M/70 8.3/11 7 DB
X-500HNA	HD REPEATER VER X-500
X-50A	2M/70CM 5 6'H 4.5/7 2 DB
X-700	2M/70CM 24'H 9 3/13 DB

rfconcepts

MODEL	DESCRIPTION
2-117	144MHz AMP10WIN 170WOUT
2-217	144MHz AMP 2WIN 170WOUT
2-23	144MHz AMP 2WIN 30WOUT
2-317	144MHz AMP 30WIN 170WOUT
2-417	144MHz AMP 45WIN 170WOUT
2/70	DUAL 3–30W 2M/5–20W 440
2/70G	PREA 3–30W 2M/5–20W 440
3-112	220MHz 10WIN 120WOUT
3-211	220MHz 2WIN 110WOUT
3-22	220MHz AMP 2WIN 20WOUT
3-312	220MHz 30WIN 120WOUT
4-110	440MHz AMP 10WIN 100WOUT
4-310	440MHz AMP 30WIN 100WOUT
4-32	440MHz AMP 3WIN 20WOUT
RFC-2/70	DUALBAND AMP 5WIN 25WOUT

AEA ADVANCED ELECTRONIC APPLICATIONS

MODEL	DESCRIPTION
ISOLOOP	14–30MHz HF ANTENNA
ISOPOLE144	2M BASE VERTICAL
MM-3	TRAINER/KEYER
PCB-88	IBM COMP PLUG-IN BRD
PK 232MBX	ALL-MODE RTTY, CW
PK-88	PACKET TNC 300/1200 BAND

KANTRONICS

MODEL	DESCRIPTION
DATA ENGINEER	TNC SOFTWARE
KAM	CW/RTTY/PACKET/FAX TNC
KPC-2	300/1200 BAUD PACKET TNC
KPC-2400	300/1200/2400 TNC
KPC-4	DUAL PORT VHF PACKET TNC

DAIWA

MODEL	DESCRIPTION
CN101	METER 1 8–150 MHz 15/1 5K
CN103	140–525 MHz SWR/PWR METER
CN410M	3 5–150 MHz SWR/PWR MTR
CN460M	140–450 MHz SWR/PWR MTR
CN465	METER 140–450 MHz 15/75W
CN520	METER 1 8–60 MHz 200/2kW
NS660A	METER 1 8–150 MHz 30/3kW
NS660PA	METER 1 8–150 MHz 3kW
NS663BM	SWR METER BASE UNIT
NS663BN	METER 150–525 MHz 300W

cushcraft CORPORATION

MODEL	DESCRIPTION
A3S	ANT HF 10/15/20M 3 EL STAI
A3WS	ANT HF 12/17M, 3 EL, 8DB, STAI
A4S	ANT HF TRIBANDER 10/15/20
AP8	ANT HF 80–10 WARC VERTICAL
AR-10	TEN METER RINGO
AR-2/70	2M/70CM BASE VERTICAL
ARX-220B	220 MHz VERTICAL
ARX-2B	VHF 2M VERTICAL
AV3	HF 20/15/10M VERTICAL
AV5	ANT HF 80/40/20/15/10 VERTICAL
R5	HF 20/17/15/12/10 VERTICAL
R7	7, 10, 14, 18, 21, 24, 28M VERTICAL

ASTRON CORP.

MODEL	DESCRIPTION
RM-35M	POWSUP 19" RACK 25, 35AC
RM-50M	POWSUP 19" RACK 35, 50AC
RS-12A	POWSUP 12V, 9A CONT 12SUR
RS-12M	12V, 9 C 12S W METERS
RS-12S	POWSUP 12V 7.5 10C SPKR
RS-20A	POWSUP 12V, 16 CON 20 SUR
RS-20M	POWSUP 12V 16C 20S W MET
RS-20S	POWSUP 12V 16, 20C SPKR
RS-35A	POWSUP 12V, 25 CON 35 SUR
RS-35M	POWSUP 12V, 25C, 35S W MTR
RS-50A	POWSUP 12V, 35 CON 50 SUR
RS-50M	POWSUP 12V, 35C 50S W MET
RS-7A	POWSUP 12V 5A CON 7A SUR
VS-20M	16A, 20C MTR VOL/CUR CON
VS-35M	POWSUP 12V25C 35S MET VA
VS-50M	POWSUP 12V35C 50S MET VA

B & W • BENCHER • BUTTERNUT • CUSHCRAFT • • HYGAIN • ICOM • KANTRONICS •

AEA • KENWOOD • ASTRON • ALPHA-DELTA • AMERITRON • ANTENNA SPEC • AEA • KENWOOD • ASTRON • ALPHA-DELTA • AMERITRON • ANTENNA SPEC

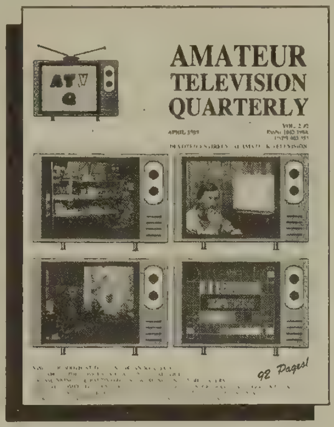
CIRCLE 162 ON READER SERVICE CARD

HAMS SHOULD BE SEEN AS WELL AS HEARD!

A PICTURE IS WORTH 100 WPM/CW!

ANY LICENSE CLASS HAM CAN COMMUNICATE USING LIVE TV ON THE UHF AND UP FREQUENCIES. TRANSMIT ANY VIDEO SOURCE, COMPUTER, PACKET, RTTY, VIDEO TAPE, LIVE CAMERA, NASA SATELLITE FEEDS, HAM MEETINGS, PUBLIC SERVICE ACTIVITIES, WEATHER, ETC.

READ AND LEARN ABOUT HAM TV ACTIVITY, PROJECTS, PUBLIC SERVICE AND VIDEO COMMUNICATIONS IN EACH ISSUE OF AMATEUR TELEVISION QUARTERLY, DEVOTED ENTIRELY TO HAM TV.



SUBSCRIPTIONS: $18 US, $22 CANADA
$35 ELSEWHERE, SAMPLES $5

ATVQ
AMATEUR TELEVISION QUARTERLY
1545 LEE ST. SUITE 73, DES PLAINES, IL 60018
708-298-2269

CIRCLE 45 ON READER SERVICE CARD

Sell your Product in RADIO FUN Call Sue Colbert or Dan Harper TODAY! 1-800-274-7373

NEW VERSIONS AVAILABLE NOW!

Master Morse Code the easy way

CODEMASTER™
$19.95

- Complete Beginner's Tutorial
- Multiple Practice Modules To 40 WPM
- Keyboard Echo, Text file Sender
- Endorsed for Military Morse Training
- Eliminate the Plateau Effect

Take the drudgery out of log-keeping

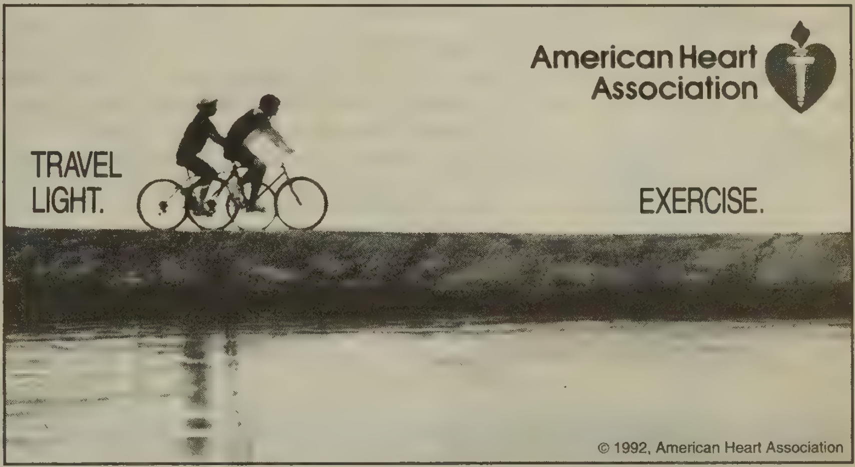
MILESTONE
LOGMASTER™
$29.95

- Easy Maintenance of Station Log
- Unlimited Log Entries, Multiple Logs, QSL Card Labels
- Index Stations Worked and Contest Logs
- Prefix Confirmations, More...

MILESTONE TECHNOLOGIES
3140 S. Peoria Street, Unit K156
Aurora, CO 80014-3155
(303) 752-3382

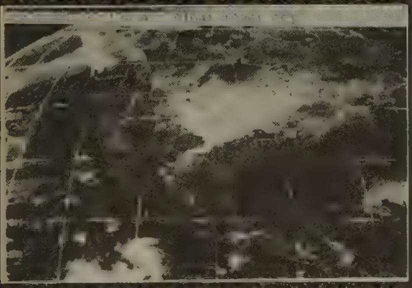
Suitable for any PC/XT/X86 Compatible with 512 KB memory, DOS 2.10 or later. Add $3.00 S/H per package, $5.00 for COD, $10.50 for express delivery. Dealer inquiries welcome. Colorado residents please add sales tax. Ask about our money back guarantee and **Free Software Offer**.

CIRCLE 221 ON READER SERVICE CARD


American Heart Association
TRAVEL LIGHT.
EXERCISE.
© 1992, American Heart Association

Sell your used gear in the *Radio Fun* Flea Market Call Judy Walker today- 1-800-274-7373

WEFAX To The Max



PC GOES/WEFAX 3.0 $250

PC GOES/WEFAX 3.0 is a professional fax reception system for the IBM PC. It includes an AM/FM demodulator, software, cassette tutorial and 325 page manaul. Check this partial list of our advanced features:

Res. up to 1280x800x256
Unattended Operation
Colorization
Zoom, Pan, Rotation
Contrast Control
Tuning Oscilloscope
Photometry/Histograms
APT Lat/Lon. Grids
Orbital Predcition
Frame Looping
PCX & GIF Export
Grayscale Printing
Infrared Analysis
Variable IOC & LPM

PC HF FACSIMILE 6.0 $99

PC HF Facsimile 6.0 is a complete shortwave FSK fax system for the IBM PC. It includes an FSK Demodulator, software, 250 page manual and tutorial cassette. Call or write for a complete catalog of products.

Software Systems Consulting
615 S. El Camino Real, San Clemente, CA 92672
Tel:(714)498-5784 Fax:(714)498-0568

CIRCLE 250 ON READER SERVICE CARD

33rd ANNUAL

TROPICAL HAMBOREE
AMATEUR RADIO & COMPUTER SHOW
ARRL HAMFEST OF THE AMERICAS
FEBRUARY 6 - 7, 1993
DADE COUNTY YOUTH FAIR & EXPOSITION CENTER • MIAMI, FLORIDA
• Sponsored by Dade Radio Club of Miami, Inc.

• PROGRAMS & ACTIVITIES FOR EVERYONE • 200+EXHIBIT BOOTHS • DXCC FIELD CHECKING
• 800+INDOOR SWAP TABLES • FREE PARKING FOR 15,000 VEHICLES
• 300 CAMPSITES WITH HOOK-UPS & LAUNDRY FACILITIES • ON-SITE LICENSE EXAMS

SPECIAL EVENTS!!!
"HURRICANE ANDREW COMMUNICATIONS CRITIQUE"
"EXPANDED YOUTH FORUM WITH COMPLIMENTARY ADMITTANCE FOR STUDENTS"
"CONDUCTING AMATEUR RADIO CLASSES"
(Educational forum for teachers, class instructors and parents)
"FCC FORUM"
ALL THE ABOVE IN ADDITION TO USUAL HAMBOREE FESTIVITIES

Registration: $5.00 Advance — $6.00 Door (Tax Incl.) • Valid Both Days (Advance deadline Feb. 2)
Swap Tables: $20.00 each (Tax Incl.) + Registration • Power: $10.00 per User (Tax Incl.)
Campsites: 3 Days (Fri., Sat., Sun.) $40.00 (Tax Incl.) • 4 Days (Thurs., Fri., Sat., Sun.) $55.00 (Tax Incl.)
Headquarters Hotel: Miami Airport Marriott - $69.00 Single, Double + Tax
Call: (305) 649-5000 — Speak Only to Reservation Department
Must Mention "Tropical Hamboree" to Get Special Rate. Deadline Jan. 25, 1993
After Deadline, Special Rates on Room Available Basis Only • Alternate Facilities: Contact Hamboree Chairman

WRITE TODAY FOR DETAILS BROCHURE & RESERVATION FORMS
(Available Dec. 1st)

Send to: Chairman, Evelyn Gauzens, W4WYR
2780 N.W. 3rd Street, Miami, FL 33125
Tel: (305) 642-4139 • Fax: (305) 642-1648

(All checks for tickets, camping and tables should be made payable to: Dade Radio Club of Miami, Inc.)

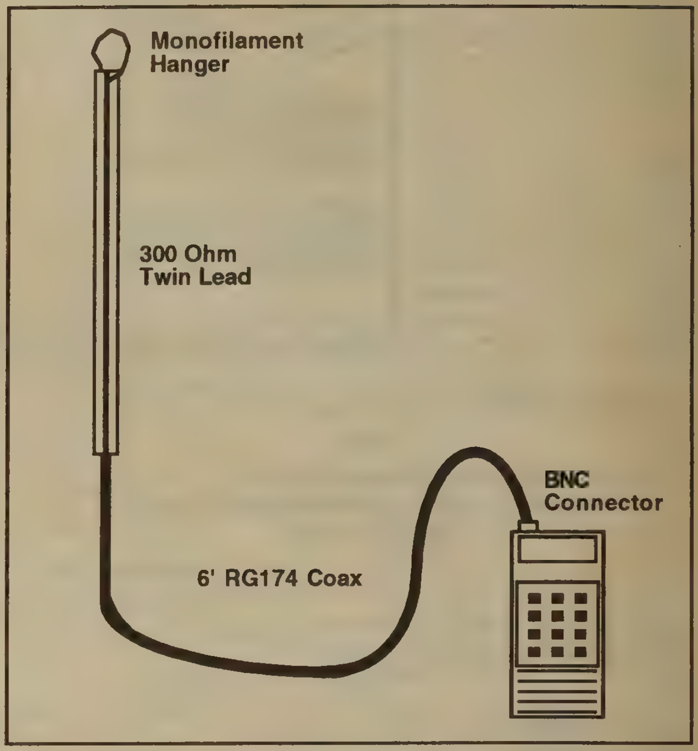
CIRCLE 50 ON READER SERVICE CARD

RF review

The Pico-J

by James H. Gray W1XU

Antennas West
Box 50062-D
Provo UT 84605
Telephone: (801) 373-8425
(800) 926-7373
Price Class: $19.95



The Pico-J antenna.

During my years of traveling around the eastern United States on business or vacation, I often wished I had a small, inexpensive and easy-to-use antenna to match my little hand-held 2 meter radio. Occasionally I had an HF rig in the car, but more often it was the little 2 meter radio which was useful and fun. On long road trips it alleviated boredom, kept me awake and almost always assisted me to find a motel, restaurant, or other ham's QTH. On such trips the mobile antenna was very satisfactory and I seldom needed any other antenna.

However, when I traveled by plane, the "rig" was the handheld without a "brick" or amplifier to boost its output. Further, it had only a small telescoping whip that I could extend to about 19 inches. If I happened to be close enough to a repeater in a large city, that was fine and I managed to "work" the locals in spite of low power and a minimal antenna.

Nevertheless, there were occasions when there was no local repeater, or when I was inside a steel-and-concrete building. At such times I wasn't able to make any contacts at all and had to resort to the usual dull and tedious television programs before going to bed.

If any of this sounds familiar to you, then you have probably faced similar problems when traveling "light" and by air, and know how it feels to be alone among the many. No doubt you may have tried some of the same "fixes" I did: perhaps a small briefcase antenna or even a foil antenna put up to the window with some kind of sticky tape and a paper clip to fit into the BNC on the handheld . . . or even other and stranger things. Inevitably, these things were failures.

The Solution

Today, the travelin' man needn't worry; he has a ready solution to the problem: a neat antenna produced by Antennas West and called the Pico-J . . . an antenna which meets all of the requirements set forth in the first sentence of this article. Pico means "small," as in "picofarad," and "J" is the rough configuration of this antenna. The J-pole is well-known in the literature and is usually made of tubing that can be mounted to a bracket on the side of a tower, a building, or mast. It has the advantage of a low-angle, omnidirectional and vertically polarized radiation pattern . . . just what's needed for 2 meters.

As you'll see, however, Antennas West's Pico-J offers some features not found in the well-known J-pole. For example, the feedpoint is already found and matched for you, and the antenna is small and light—so much so that it can be rolled up and stuffed in your pocket or in a small case the size of your eyeglasses case. Actually, it doesn't look like a "J" at all. The smaller "lip" portion is now made as a portion of the vertical larger part and extends the overall length to about 55 inches from its top to the point where a six-foot length of small-diameter coaxial cable feedline is attached. The "J" itself is made from a very tough length of transmitting quality twinlead and the feedline is terminated with a gold-pin BNC for direct attachment to your radio.

A small loop of heavy-duty monofilament fishline is attached to the top of the Pico-J, and this can be slipped over a curtain rod or a nail or any other suitable projection . . . but, if by chance you don't happen to find a suitable support, Antennas West thoughtfully provides a small suction cup with an embedded hook that can be slapped up on a window or any smooth surface. Then, all you need to do is slip the fishline loop onto the hook in the suction cup, and—presto!—you have your antenna support.

As Jim Stevens of Antennas West says: " . . . it waits like a very powerful genie in a bottle until you need a full-quieting signal." It is completely weather-sealed and could be hung outdoors if you wish. Otherwise, you can hang it in a closet or a doorway; in fact, anywhere that is convenient and where your signal won't be blocked. The extra reach provided by this beauty could be of lifesaving importance in an emergency, and is always useful when just plain chatting with the locals. Your Pico-J stretches range, improves reception, reaches faraway repeaters and saves your battery pack.

The measured VSWR is less than 2:1 between 142 and 150 MHz—ideal for CAP and other services near the 2 meter band—and is less than 1.5:1 between 143 and 150 MHz, bottoming out at a very beautiful 1:1 at 146 MHz. Not bad, eh?

Best of all, considering the benefits, is the price: $19.95, which includes the soft vinyl case to store your Pico-J when it's not in use. On a recent trip I tucked the case with Pico-J inside into my briefcase, right next to the handheld. No, I didn't even use the "duckie" or the telescoping whip because I had all I needed in this one neat antenna. Maybe you'll find the same. RF

AMSAT

Dedicated to Keeping Amateur Radio in Space!

AMSAT — The Radio Amateur Satellite Corporation is an organization of Radio Amateurs who design, build and launch satellites for use by Radio Amateurs around the world.

Your new Amateur Radio License will be your ticket to a whole world of exciting opportunities. Why not expand your horizons even further by becoming a member of AMSAT and participating in space aged Amateur Radio?

Join the Excitement! Join the Fun! Join AMSAT!

Yearly Membership dues: $30 U.S., $36 Canada/Mexico, $45 Elsewhere JOIN NOW!

Name__________ Call__________
Address__________
City__________ State______ Zip__________

$15 of membership dues goes toward a subscription to *The AMSAT Journal*

Post Office Box 27, Washington, DC 20044
Telephone 301-589-6062 Fax 301-608-3410

CIRCLE 110 ON READER SERVICE CARD

Voice ID Kit

- Featuring New Analog Storage Voice Chip
- Record and Play Back up to 16 seconds
- Divided into Two 8-second message spaces
- Makes a Great Contest Mike or Repeater ID

- $99 ppd.

Micro-TV Transmitter Kit

- 80 milliwatt output on 434 MHz
- Smaller than a Postage Stamp

- $89 ppd.

ELKTRONICS - NE
Rt. 1 Box 789
Hancock, NH 03449
(603) 525-4001

SUPER QRP TRANSMITTER!

It's so easy — It's ready to go!

CRYSTAL OPTIONAL

Completely built and tested, extremely high quality.

- Complete low power CW transmitter
- Up to 2-2½ watts RF output
- Excellent keying characteristics
- 10-16 VDC operation
- Compact, rugged and easy to operate.
- **Not** a poorly designed, low quality kit

Just connect a battery, antenna, key and plug in your favorite crystal—That's it!

Huge Savings During The Entire Month

SW1-20M	**$14.95**	SW1-80/75M	**$21.95**
SW1-30M	**$14.95**	SW1-160M	**$27.95**
SW1-40M	**$15.95**	Metal Case	**$6.95**

Xtals: 14060, 10106, 7125, 7040, 3700, 3535 **$5.95 each**

To order: Specify meter band desired and include check or money order for correct amount. Also include $2.50 (Foreign orders add 20%) for shipping and handling. PA residents add 6% sales tax to price of unit(s). Foreign orders must send money order drawn on ***U.S. correspondent bank*** *only.*

RYAN COMMUNICATIONS

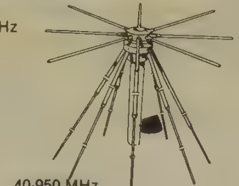
Box 111E Camelot Rd., Portersville, PA 16051, USA

(412) 368-3859

CIRCLE 32 ON READER SERVICE CARD

Finest European Made Antennas

2 METERS 144-175 MHz
70 cm 440 MHz



40-950 MHz
Discone Scanner Antenna
Commercial Grade
Stainless Steel
Finest Quality Throughout

25° Adjustable Connector
Fits Any Antenna With
"N" Type Connector

800-960 MHz
Compact Size Cellular
Telephone Antenna

- Change Antennas Easily With Handy Wingnut
- Fits All Cars
- Adjustable Mount - 180° Rotatable

Write For FREE Catalog

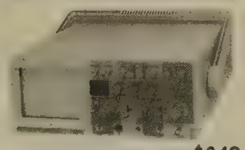
EUR-AM Electronics
P.O. Box 990
Meredith, N.H. 03253-0990

ELENCO & HITACHI & B+K PRODUCTS AT DISCOUNT PRICES

48 HOUR SHIPPING

TO ORDER CALL TOLL FREE
1-800-292-7711
1-800-445-3201 (Can.)

ELENCO OSCILLOSCOPES



S-1325 25MHz $349
Dual Trace Oscilloscope

S-1340 40MHz $495
Dual Trace Oscilloscope

S-1360 60MHz
Dual Trace, Delayed Sweep

$775
- Automatic beam finder
- Built-in component tester
- 1mV sensitivity
- Dual time base

B+K OSCILLOSCOPES

2120 - 20MHz Dual Trace	$395
2125 - 20MHz Delayed Sweep	$539
1541B - 40MHz Dual Trace	$749
2160 - 60MHz Dual Trace, Delayed Sweep, Dual Time Base	$949
2190 - 100MHz Three Trace Dual Time Base, Delayed Sweep	$1,395
2522 - 20MHz / 10MS/s Storage	$869
1442 - 20MHz Portable	$1,229
1443 - 40MHz Battery / AC operated with Cursor & Readouts	$1,439

1.0GHz PORTABLE SPECTRUM ANALYZER
Model 2610 $2,595.95

- AC/DC operation (battery included)
- 70 dB dynamic range
- Resolution bandwidth of 10kHz
- 50Ω and 75Ω input impedance (switch selectable)
- Fixed bandwidth setting for viewing TV signals
- Field calibratible with internally generated 100MHz, 80dB signals

Hitachi Compact Series Scopes

V-212 - 20MHz Dual Trace	$409
V-525 - 50MHz, Cursors	$975
V-523 - 50MHz, Delayed Sweep	$949
V-522 - 50MHz, DC Offset	$849
V-422 - 40MHz, DC Offset	$749
V-222 - 20MHz, DC Offset	$625
V-660 - 60MHz, Dual Trace	$1,095
V-665A - 60MHz,DT, w/cursor	$1,325
V-1060 - 100MHz, Dual Trace	$1,375
V-1065A - 100MHz, DT, w/cursor	$1,649
V-1085 - 100MHz, QT, w/cursor	$1,995
V-1100A - 100MHz, Quad Trace	$2,195
V-1150 - 150MHz, Quad Trace	$2,695

Hitachi RSO Series

RSO's feature; roll mode, averaging, save memory, smoothing, interpolation, pretriggering, cursor measurements

VC-6023 - 20MHz, 20MS/s	$1,650
VC-6024 - 50MHz, 20MS/s	$1,950
VC-6025A - 50MHz, 20MS/s	$2,350
VC-6045A - 100MHz, 40MS/s	Call
VC-6145 - 100MHz, 100MS/s	Call

Digital Capacitance Meter
CM-1550B

$58.95
9 Ranges
1pf-20,000ufd
5% basic accy
Zero control w/ Case
Big 1" Display

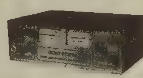
Digital LCR Meter
LC-1801
$125
Measures.
Coils 1uH-200H
Caps .1pf-200uf
Res .01-20M
Big 1" Display

Multimeter with Capacitance & Transistor Tester
$55 CM-1500B
Reads Volts, Ohms
Current, Capacitors,
Transistors and
Diodes / with case

FLUKE MULTIMETERS

Scopemeters		(All Models Available Call)	
Model 93	$1,095.00	**70 Series**	
Model 95	$1,395.00	Model 70II	$65.00
Model 97	$1,695.00	Model 77II	$145.00
10 Series		Model 79II	$169.00
Model 10	$62.95	**80 Series**	
Model 12	$79.95	Model 87	$289 00

Quad Power Supply XP-580



$69.95
2-20V @ 2A
12V @ 1A
5V @ 3A
-5V @ .5A

Fully regulated and short circuit protected

Triple Power Supply XP-620

Assembled $75
Kit $50
2 to 15V @ 1A,
-2 to -15V @ 1A
(or 4 to 30V @ 1A)
and 5V @ 3A

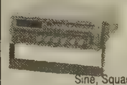
All the desired features for doing experiments. Features short circuit protection, all supplies

AM/FM Transistor Radio Kit with Training Course

Model AM/FM 108
$27.95
14 Transistors ◆ 5 Diodes
Makes a great school project

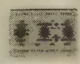
True RMS 4 1/2 Digit Multimeter
M-700T
$135
05% DC Accuracy
1% Resistance
with Freq. Counter
Data Hold

Sweep/Function Generator with Freq. Counter



$259
Elenco
Model GF-8026
Sine, Square, Triangle, Pulse, Ramp
.2 to 2MHz, Freq Counter .1-10MHz
Internal Linear & Logic Sweep

Function Generator Blox
#9600



$28.95
Provides sine, triangle, square wave from 1Hz to 1MHz
AM or FM capability
Kit
$26.95

XK-500 Digital / Analog Trainer

A complete mini-lab for building, testing, prototyping analog and digital circuits

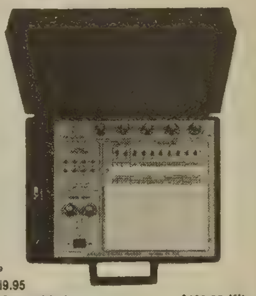
Elenco's Digital/Analog Trainer is specially designed for school projects, with 5 built-in power supplies. Includes a function generator with continously variable, sine, triangular, square wave forms. All power supplies are regulated and protected against shorts.

Power Supplies
- Variable Power Supply
- +1.25 to 20VDC @ .5 Amp (+1.25 to 15VDC @ 1 Amp)
- -1.25 to -20VDC @ .5 Amp (-1.25 to -15VDC @ 1 Amp)
- +12VDC @ 1 Amp
- -12VDC @ 1 Amp
- +5VDC @ 1 Amp
- 30VAC Center tapped @ 15VAC at 1 Amp

Analog - Section
- Function Generator Sine, Triangular, Square wave forms
- Frequency adjustable in five ranges from 1 to 100KHz
- Fine frequency adjust
- Amplitude adjust
- DC offset
- Modulation FM AM

Digital - Section
- Eight data swiches
- Two no bounce logic switches
- 8 LED readouts TTL buffered
- Clock frequency 1 to 100KHz
- Clock amplitude 5VPP square wave

Breadboards
- 2 breadboards, each contain 840 tie points (total 1,680)

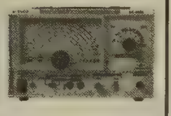


$159.95 Assembled
$129.95 Kit

Learn to Build and Program Computers with this Kit
Includes: All Parts, Assembly and Lesson Manual
Model MM-8000
$129.00

Starting from scratch you build a complete system. Our Micro-Master trainer teaches you to write into RAMs, ROMs and run a 8085 microprocessor, which uses similar machine language as IBM PC

Elenco Wide Band Signal Generators



SG-9000 $129
RF Freq 100K-450MHz AM Modulation of 1KHz Variable RF output
SG-9500 w/ Digital Display & 150 MHz built-in Counter $249

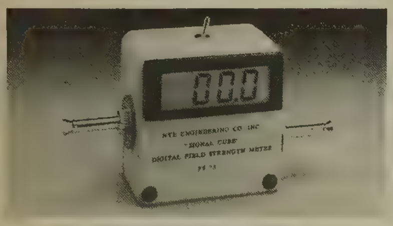
WE WILL NOT BE UNDERSOLD
UPS SHIPPING: 48 STATES 5%
IL RES 7.5% TAX ($3 min $10 max)
PROBES INCL. ALL SCOPES & METERS

C&S SALES INC
1245 ROSEWOOD, DEERFIELD, IL 60015
FAX: 708-520-0085 • (708) 541-0710

VISA MasterCard

15 DAY MONEY BACK GUARANTEE
FULL FACTORY WARRANTY
WRITE FOR FREE CATALOG

CIRCLE 184 ON READER SERVICE CARD



SIGNAL CUBE®

Digital Field Strength Meter

High Resolution R.F.
Amplitude Measurements

NYE ENGINEERING CO. INC.
4020 Galt Ocean Drive #606
Ft. Lauderdale, FL 33308
Phone: 305-566-3997
Fax: 305-537-3534

$159
+ shipping

CIRCLE 290 ON READER SERVICE CARD

THE FAMED 2 METER A. S. A. 9209

+9 db Co-Linear "MultiWave" Base Station Double 5/8 over 1/4 wave delivers up to +9 db gain. All fiberglass & solid aluminum construction. Fits masts up to 1-1/2". 2 Meter Base Station 10' length.

Model 9209
+9db

$29.73

+$4.00 S&H
(SC RES. 5% SALES TAX)
CHECK IN ADVANCE OR C.O.D.
ALSO AVAILABLE IN 220 & 440

ASA

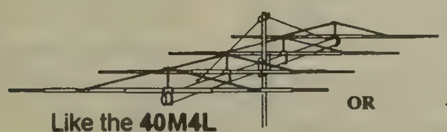
"Service is the Reason For Our Success"

Tel: (803)293-7888
Watts: 1-800-722-2681
P.O. Box 3461
Myrtle Beach, SC 29578

CIRCLE 18 ON READER SERVICE CARD

M2 Has Antennas for the future

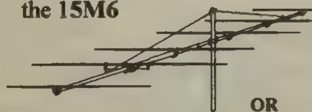
SURE M² *Has a lot of innovative* NEW ANTENNAS!!



Like the **40M4L**

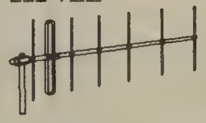
OR

the 15M6



OR

222-7EZ



OR

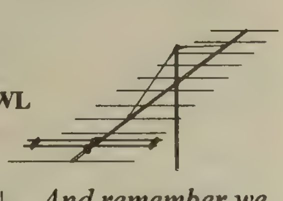
23CM22EZ

OR

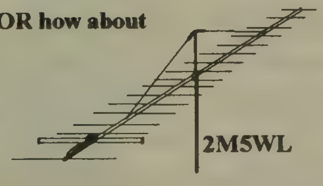
2MQLOOP

BUT DON'T FORGET THE GREAT ONES THAT STILL BREATH FIRE ON THE BANDS!

like the
6M2.5WL



OR how about



2M5WL

OR

10M7

OR

2MCP22

OR

436CP3

And remember we can help with the phasing harnesses, power dividers, H frames and of course AZ and EL rotators!

M² Enterprises 7560 N. Del Mar Fresno, CA 93711 (209) 432-8873 FAX (209) 432-3059

CIRCLE 274 ON READER SERVICE CARD

activities calendar

Send your announcements to: Radio Fun Activities Calendar, 70 Route 202-N, Peterborough NH 03458.
We'll print as many as space allows, on a "first come-first listed" basis.

DEC 5

ALAMAGORDO, NM The Alamogordo ARC will sponsor VE test sessions beginning at 12 noon. Persons already holding an Amateur license and wishing to upgrade, must bring their original license and CSCE (if any) and a copy of both. Contact *Ole WA5IPS, (505) 437-5896* or *Larry WA5UNO, (505) 437-0145* for info. Talk-in on 146.80 -600.

MESA, AZ The Superstition ARC. WB7TJD, will sponsor this year's Hamfest at Mesa Community College, Dobson Rd., between SR360 and Southern Ave., SW campus corner, 7 AM-2 PM. Tailgating. Admission: Commercial $10, Sellers $5, Buyers $2 per car. Talk-in: WB7TJD 147.120 +600; 146.84 -600. Contact *Bill Howes KG7XB, 718 N. 94th St., Mesa AZ 85207. Tel. (602) 380-4839*, or write to: *SARC, P.O. Box 1551, Apache Junction AZ 85217*.

DEC 12

HUNTINGTON, WV The Tri-State ARA, Inc., will sponsor W5YI VE Exams at Our Lady of Fatima church school class rooms, 545 Norway Ave. No preregistration necessary. Please bring a photo ID, copy of current licenses or original CSCE, and a completed Form 610 (Form 610 will be available at the session). Please arrive by 9:15 AM in order to register and have ID and Form 610 checked prior to examination. For info call *Jim Baker K8KVX, (304) 736-6542*.

DEC 20

MILFORD, CT The Fowler Bldg., 145 Bridgeport Ave., will be the site for VE Exams sponsored by the Coastline Amateur ARA. All classes. Begins at 12 noon. Walk-ins. Contact *Gary NB1M, (203) 933-5125*, or *Dick WA1YQE, (203) 874-1014*.

JAN 10

MILWAUKEE, WI The 21st annual Midwinter Swapfest will be sponsored by the West Allis RAC at the Waukesha Co. Expo Center Forum from 8 AM-2 PM. Directions: I-94 to Co. J, south to FT, west to Expo. Advance tickets $3; $4 at the door. Table space: First 4' $3 in advance; $4 at the door. Additional 4' $4 in advance, $5 at the door; electrical outlet $5 if available. Advance reservation deadline Dec 31, 1992. VE Exams given at Red Carpet Lanes (across the street) starting at 9 AM. Write with SASE to *WARAC Swapfest, P.O. Box 1072, Milwaukee WI 53201.*

SPECIAL EVENT STATIONS

DEC 12

BROOKHAVEN, MS The Southwest MS ARC will operate NM5Z from 1400Z-2400Z to celebrate 175 years of statehood and Mississippi Homecoming. Operation will be in the lower General portion of 40, 20 and 15m phone subbands, and the Novice 10m phone subband. For QSL, send your QSL and SASE to *Mississippi Homecoming, c/o David Pickard NM5Z, Route 4, Box 386, McComb MS 39648.*

DEC 19

PERRIS, CA The Hams of the Orange Empire Railway Museum will operate KC6TKT and other calls 1900Z-2359Z to celebrate their annual North Pole Limited Steam Train operation. Frequency: SSB 28.340 MHz. For QSL, send QSL and #9 SASE to *OERM, P.O. Box 548, Perris CA 92572-0548.*

DEC 19-20

NORTH POLE, AK The North Pole Hamsters ARC will operate Station WL7CX from the home of Santa Claus. Operation will be on 20m and the Novice portion of 10m. Send QSL and SASE to *N.P. Hamsters ARC, P.O. Box 56424, North Pole AK 99705.*

DEC 23-24

SMITHFIELD, NC Triangle East ARA will operate N4SXG from 1300Z-2300Z to commemorate the 70th anniversary of the birth of the late Ava Gardner. Frequencies: CW—3.715 and 7.135; PHONE—14.260 and 28.335. For certificate or card, send QSL and appropriate SASE to *TEARA, 209 N. Third St., Smithfield NC 27577.*

DEC 30-JAN 1

PASADENA, CA The Relay Repeater Club will operate Station KF6UF, 1600Z-0200Z each day, Dec. 30-Jan 1, from the Wrigley Mansion, to commemorate the 104th anniversary of the Tournament of Roses—104 years of the Rose Parade and 79 years of the Rose Bowl Game. Primary frequency will be 28.460 MHz. Secondary frequencies will be 21.335 MHz and 14.260 MHz. Amateurs in California/Nevada can contact the station on the half hour, on 2m, through the 147.21+ rptr., or on the hour on 220 MHz, via the Condor Connection. For a certificate, please send a QSL with Contact Number and a 9 x 12 SASE with 58 cents postage to *Relay Repeater Club, P.O. Box 81, Arcadia CA 91066-0081*.

JAN 2-3 and JAN 9-10

FLEN, SWEDEN The 22nd annual Hunting Lions in the Air Contest, sponsored by the Int'l. Assn. of Lions Clubs, and coordinated by the Lions Club Flen (Sweden), will be active on CW from 0900 UTC Sat. Jan 2-2100 UTC Sun. Jan. 3. SSB will be active 0900 UTC Sat. Jan 9-2100 UTC Sun. Jan 10. For rules and info, please write to: *Contest Committee, Lions Club Flen, Box 106, 642 23 Flen, Sweden.* All logs must be mailed by Feb. 15, 1993.

NATIONAL TOWER COMPANY
P.O. Box 15417 • Shawnee Mission, KS 66285
800-762-5049
Hours: 8:00 to 5:00 M-F
Prices Subject to Change Without Notice
LOCAL: 913-888-8864

★★★★★ POWER SUPPLIES ★★★★★

TENNA PHASE III
All are electronically regulated 110 volt input

PS3	3 AMP	$16.90
PS4	4 AMP	$21.90
PS7	5 AMP	$27.90
PS12	8 AMP	$39.90
PS14	10 AMP	$46.90
PS20	17 AMP	$74.90
PS25	22 AMP	$99.90
PS35	31 AMP	$139.90
PS50	46 AMP	$199.90

ASTRON

RS4L	$44.95	RS5L	$49.95
RM12A	$98.00	RM35A	$215.00
RM50A	$242.00	RM60A	$313.00
RM12M	$119.00	RM35M	$236.00
RM50M	$259.00	RM60M	$343.00
RS7A	$51.00	RS10A	$63.00
RS12A	$73.00	RS20A	$90.00
RS35A	$144.00	RS50A	$205.00
RS12M	$84.00	RS20M	$110.00
RS35M	$165.00	RS50M	$225.00
RS7S	$68.95	RS10S	$74.95
RS12S	$83.00	RS20S	$101.00
VS12M	$101.00	VS20M	$128.00
VS35M	$179.00	VS50M	$237.00

TRIPP • LITE

PR3	3 AMP ICS	$23.90
PR4.5	4.5 AMP ICS	$31.90
PR7	7 AMP ICS	$38.90
PR10	10 AMP ICS	$59.90
PR25	25 AMP ICS	$122.90
PR40	40 AMP ICS	$155.90
PR60	60 AMP ICS	$225.90

WE HAVE DC TO AC INVERTERS

ROHN TOWERS

MODEL	HGT	LOAD	PRICE
BX40	40	6 sq'	$220.00
BX48	48	6 sq'	$280.50
BX56	56	6 sq'	$375.50
BX64	64	6 sq'	$484.50
HBX32	32	10 sq'	$193.50
HBX40	40	10 sq'	$254.50
HBX48	48	10 sq'	$346.00
HBX56	56	10 sq'	$450.00
HDBX32	32	18 sq'	$228.00
HDBX40	40	18 sq'	$320.00
HDBX48	48	18 sq'	$432.00

TILT BASE OR BASE STUBS EXTRA
WE SELL ONLY GENUINE ROHN ACCESSORIES

STACKING SECTIONS

25G	MEDIUM DUTY 12"	$62.90
45G	HEAVY DUTY 18"	$144.00
55G	EXTRA HEAVY 18"	$185.00

CALL FOR PACKAGE PRICING

CELWAVE HARDLINE & COAX

810918-001	1/2 CELLFLEX	$1.90'
810921-001	7/8 CELLFLEX	$4.90'

BELDEN

9913	.48'	8267	.49'
8214	.43'	8219	.18'

ALLIANCE

HD73	10 sq ft	$159.90
U105	light weight	$59.90

TELEX
LARGE STOCK OF TELEX ROTORS AND ANTENNAS

MIDLAND ANTENNAS

18-259A	2M ON GLASS	$29.90
18-300	2M MAG MOUNT	$27.50
18-310	2M NMO MOUNT	$17.90
18-325	DUAL BAND	$22.66
18-329	2M, 220, 440 MAG	$11.90
18-330	UHF NMO MOUNT	$14.90
18-336	220 NMO MOUNT	$17.20

10 METER TRANSCEIVERS

RCI 2970	*NEW*	$419.90
RCI 2950		$249.90
UNIDEN HR2510		$249.90
RANGER AR3500.100		$449.90

UNIDEN BEARCAT SCANNERS

12 BAND WITH 800 MHz		
BC855XLT	50 CHAN Base	$178.90
BC800XLT	40 CHAN Base	$234.90
BC760XLT	100 CHAN Base/Mobile	$248.90
BC200XLT	200 CHAN Handheld	$228.90
11 BAND WITH AIRCRAFT		
BC590XLT	100 CHAN Base/Mobile	$189.90
BC177XLT	16 CHAN Base	$129.90
BC100XLT	100 CHAN Handheld	$159.90
10 BAND		
BC560XLT	16 CHAN Base/Mobile	$94.90
BC147XLT	16 CHAN Base	$89.90
BC145XLT	16 CHAN Base	$82.90
BC70XLT	20 CHAN Handheld	$138.90
BC65XLT	10 CHAN 10 Band *NEW*	$124.90
BC55XLT	10 CHAN Handheld	$99.90

GRE CONVERTERS & AMPLIFIERS

Super Amp	handheld amp	$54.90
3001	base pre-amp	$62.90
8002	handheld conv	$79.90
9001	base converter	$74.90

SCANNER ANTENNAS

DIAMOND	D130J WIDEBAND	$82.90
HUSTLER	DCL WIDEBAND	$24.33
VALOR ON GLASS	TGS	$26.90

DIAMOND ANTENNAS

CR214S	2M/220 MOBILE	$47.90
NR770SA	2M/440 MOBILE	$35.90
SG7500A	2M/440 MOBILE	$69.90
X50A	2M/440 BASE	$94.90
X510MA	2M/440 BASE	$135.75
X700HA	2M/440 BASE	$336.90

CUSHCRAFT ANTENNAS

ARX2B	7DB 2M BASE	$44.50
AR270	2M/440 BASE	$56.00
ARX450B	440 BASE	$45.50
R5	NO GROUND VERT	$249.00
R7	NO GROUND VERT	$344.00
A3S	TRI-BAND BEAM	$310.00
A4S	TRI-BAND BEAM	$371.00
13B2	2M BEAM	$92.00
17B2	2M BEAM	$152.00
A147-11	2M BEAM	$60.00
CS270M	Dual Band Mag Mount	$59.90

OTHERS IN STOCK

HUSTLER ANTENNAS

4BTV	40-10 VERT	$84.00
5BTV	80-10 VERT	$109.00
6BTV	6 BAND VERT	$129.00
FX2	2M MAG MOUNT	$21.90
RX2	2M MAG MOUNT	$16.90
BBLT144A	2M TRUNK MOUNT	$36.00
UGM	1/4 W UHF/VHF MAG	$14.90
G6144B	2M BASE	$84.98
G7144	2M BASE	$128.77
G7220	220 BASE	$122.22
RM20S	20M RESONATOR	$18.90
RM40S	40M RESONATOR	$23.90
RM75S	75M RESONATOR	$33.90
G6270	DUAL BAND	$123.90

BIRD WATT METER

MODEL 43	$207.00

DIAMOND METERS

SX200	1.8-200MHz	$94.90
SX400	140-525MHz	$110.90
SX600	1.8-525MHz	$173.90
SX1000	up to 1300MHz	$233.00

RCI *COMPACT PORTABLE TRANSCEIVER*

MM1000 $79.90

1 Watt – 2 Channel, 1 Ch Installed – 151.625 or 154.570 or 154.600 MHz, Compact, **Rugged & Light weight,** Diecast Frame, **Weather Resistant High Impact Case,** Squelch, Stainless Steel Belt Clip with Rechargeable Nicad Battery, Wall Charger, and Rubber Duck Antenna. 2 1/2W x 1D x 5 1/2H

NEUTEC

CIRCLE 91 ON READER SERVICE CARD

SELL YOUR PRODUCT IN *RADIO FUN!* CALL SUE COLBERT OR DAN HARPER TODAY AT 1-800-274-7373

Don't Miss Out On A Single Issue! To Subscribe to *Radio Fun* Call Today! 1-800-257-2346

UNAMSAT-1 News

UNAMSAT-1, a microsat built by the Autonomous University of Mexico, could be aloft via a piggyback launch on a CIS Russian Metsat in December. What is most interesting about this project is not its microsat digital store and forward capability, which is of the 1980s FSK up, PSK down type, but its supplementary module featuring a 40 MHz meteor radar.

This meteor radar is a highly ambitious departure. We know (from IRAS, and the European, Russian and Japanese comet probes) that most meteor trails are caused by comet dust colliding with the earth's upper atmosphere. Anyone who listened to the recent Perseids around 1900 UTC on the 11th of August will know the Doppler shift on some meteor echoes can be very pronounced. Doppler can tell us in an indirect way the minimum speed at which the comet dust/meteor was traveling as it hit the ionosphere. In this way we may be able to get a good answer to a question which has interested comet watchers for centuries: "Do all comets coming around the sun at perihelion originate in our solar system?"

The general theory that comets are formed in the outer "frozen" edges of our solar system and perhaps other star systems calls for disturbance of this edge of system comets, which now and then sends them tumbling inwards around the center of their star/solar system, or conversely causes them to leave their star/solar system and perhaps eventually enter a different star/solar system.

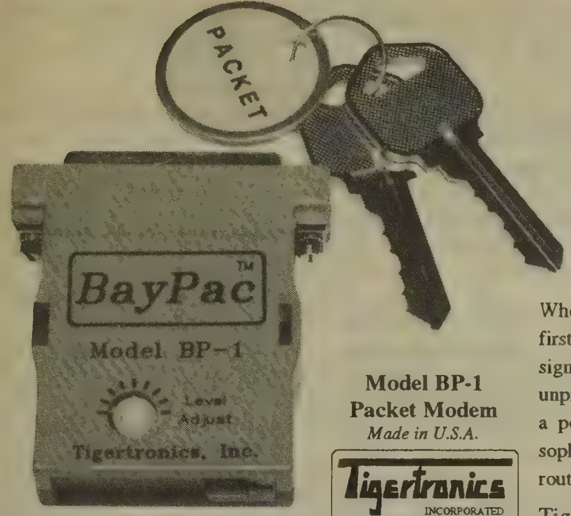
In theory, any comet whose orbit is parabolic or hyperbolic (as opposed to the closed elliptical orbit of, say, Comet Halley), could be a stray from a star system other than our own. But, orbit determination when eccentricity is near 1 or greater is notoriously difficult to obtain. However, if we get meteor reflections whose Doppler indicates a meteor velocity greater than the escape velocity from our solar system, then we may just possibly be able to suggest that it might have an extra-solar origin. Hence the attraction of UNAMSAT-1, which will use DSP techniques and report received meteor trail echoes to earth by AX.25 telemetry.

Please note in addition that one does not need to be a G3IOR to see two other possible features of this exciting experiment:

1. You will probably be able to "Ping steal" on this meteor radar, i.e. trigger your scope time base on the pulse transmitted by the satellite, then watch the scope trace for echoes—your own private meteor radar.

2. You will be able to use the 40 MHz pulses from UNAMSAT as a super downward sounding probe of the ionosphere, at all angles of penetration of the ionosphere.

So, whether you want another store and forward bird or a stunningly original experiment, UNAMSAT-1 should have what you're looking for. [Info from "Satgen 180" by GM4IHJ, 9/5/92.] *TNX Westlink Report #636, October 26, 1992; story by John Magliacane KD2BD, SpaceNews.*



- Packet Radio -
Portable & Affordable!

★ Simple Installation ★ Perfect For Portable
★ No External Power ★ Assembled & Tested
★ Smart Dog™ Timer ★ VHF, UHF, HF (10M)

Model BP-1
Packet Modem
Made in U.S.A.

Tigertronics INCORPORATED

Whether you're an experienced packeteer or a newcomer wanting to explore packet for the first time, this is the solution you've been waiting for! Thanks to a breakthrough in digital signal processing, we have developed a tiny, but full-featured, packet modem at an unprecedented low price! The BayPac BP-1 will transform your PC-compatible computer into a powerful Packet TNC. Although deceptively simple in appearance, the BP-1 supports sophisticated features like digipeating, file transfers, and remote terminal access, in addition to routine message handling. **Here is YOUR CHANCE to join the PACKET REVOLUTION!**

Tigertronics, Inc. 400 Daily Lane Post Office Box 5210 Grants Pass, OR 97527

Just...
$49.95
+ Shipping

GET YOURS TODAY!
Toll Free Order Line
1-800-8BAYPAC
(1-800-822-9722)
VISA Available Now! MasterCard
(503) 474-6700 *Fax* (503) 474-6703

CIRCLE 269 ON READER SERVICE CARD

HELPING HAMS GET ON THE AIR! SINCE 1933

INFORMATIVE STARTER KIT INCLUDES:
- Novice and Tech Written Element Study Guide
- Practice Key and Oscillator
- Code Practice Cassette Tapes
- Theory Tapes
- FCC Rule Book
- Valuable Coupons Good Toward the Purchase of Ham Radio Equipment

PACKAGE PRICE – **$59.95**

WHETHER YOU'RE AN "O.M." OR JUST A "NOVICE," QUEMENT IS SURE TO MEET ALL YOUR NEEDS!

QUEMENT
ELECTRONICS
PHONE (408) 998-5900
1000 S. BASCOM AVENUE • SAN JOSE, CA 95128

FEATURING LINES BY:
ICOM
YAESU U.S.A.
ALINCO
AND THOUSANDS OF ACCESSORIES!

CIRCLE 132 ON READER SERVICE CARD

Subscribe To Radio Fun — Call 1-800-257-2346

If You Need Software...YOU JUST FOUND IT!

** HAM*
** BUSINESS/HOME*
** GAMES*
** EDUCATION*
** DOS - WINDOWS*
FULLY FUNCTIONAL PROGRAMS

XMAS SPECIAL DOS - WINDOWS !
THE A.S.P. MONTHLY SHAREWARE PACKAGE
Ten FULL disks of the NEWEST software available!
PERFECT XMAS PRESENT FOR COMPUTER USERS!
*C.O.D ORDERS 1-800-841-6570 only *$29.95*

CALL or MAIL ORDER NOW FOR XMAS!

®
Association of Shareware Professionals
Approved Vendor

** CATALOG 1-317-742-2214 or 742-1868*
** SATISFACTION GUARANTEED*
** C.O.D. OK ADD $4.00*
** U.S.P.S shipping ADD $3.00*
** FED-X shipping available*
** Mail Check or MO save C.O.D fees!*
** Catalog included with order*

SEND FOR FREE CATALOG
N4ZDU SHAREWARE
2022 Central St
Lafayette IN. 47905

CIRCLE 21 ON READER SERVICE CARD

Radio Fun flea market

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar, and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *Radio Fun Flea Market* costs you peanuts (almost)-comes to 10 cents a word for individual (noncommercial) ads, and 70 cents a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple of months before the action starts; then be prepared. If you get too many calls, you priced it too low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right, and maybe you can help make a ham newcomer or retired old-timer happy with that rig you're not using.

Send your ads and payment to *Radio Fun Flea Market*, Judy Walker, 70 Route 202N, Peterborough NH 03458 and *get set for the phone calls.*

Give the gift of music this holiday season **THE RYTHM OF THE CODE** morse code music. See ad index to locate our display ad. KAWA PRODUCTIONS, PO Box 319, Weymouth MA 02188. RF247

THE HAM SET by Phil Karras, KB3AEG/AA. QSO Freeform Database: Save, Change, Look up your QSO's. QSL Card Printer: For any printer you can define. HP LaserJet definition file included. CODE Practice: Become a code pro fast! Practice your receive and sending skills. Send $12 for the code program or $25 for the set. CIRCLE SOFTWARE, PO Box 74, Mt. Airy MD 21771. RF248

BUILD YOUR OWN WIRE ANTENNAS. Lowest prices, parts, coax, openwire feedlines, insulators, DACRON rope, baluns, "FLEX-WEAVE"™ 168-strand #14, etc. Catalog: $1.00, DAVIS RF CO., P.O. Box 230-R, Carlisle MA 01741. 1-800-484-4002, CODE: 1356. Fax or voice: 508-369-1738. RF250

MINIATURE POLICE RADAR TRANSMITTER one mile range, $41 assembled, $31 kit, (219) 489-1711. P.O. Box 80096, Fort Wayne IN 46898. RF251

Want my **"CLEANING OUT THE SHACK" LIST?!** Lewalski, 3512 Moraga Blvd. #4102, Lafayette CA 94549. RF255

WILL SWAP MY SHIPBOARD SOUND POWERED PHONES, (WWII) working order, for your old vintage fountain pens. KB4QGJ, G.J. Rose, 524 N. Quaker Lane, Alexandria VA 22304. 703-370-1880. RF263

RADIO MODIFICATIONS by FCC licensed electronics technician. $29.95. Two month special. SASE for radios covered and mods available. Scott Littfin, N0EDV, Route 1, Box 107A, Glidden WI 54527. RF285

WATED TO BUY: Unopened or unfinished Heathkit projects. TV, ham rigs, whatever. M. Carlson, 11 North 11th Ave., Yahima WA 98902. 509-452-9002. N7RNG. RF350

FREE SHORTWAVE. Convert **any** AM Radio to receive worldband shortwave signals for pennies. Instruction booklet, $10. **ELECTROMAN,** Dept RF, Box 24474, New Orleans LA 70184. RF352

THE MOST COMPLETE AND COMPREHENSIVE RESISTOR COLOR CODE IDENTIFICATION CHART/COIL WINDING DATA CHART/L, C, F NOMAGRAPH. Is your resister identification getting rusty? Don't waste time looking for that old basic electronics book. Have this handy chart posted above your work bench. Chart includes these hard to interpret 5-band precision resistors, includes all known tolerance colors too! Included with the resistor chart is a handy coil winding data chart for RF coil windings. For those who hate to do math calculations. If you know any two of your L, C, or F, you can find the other instantly with this handy L, C, F Nomagraph! Send $3.00 to **TMS ELECTRO DATA INC.,** 4906 S.E. Mills, Lawton OK 73501. RF355

INEXPENSIVE HAM EQUIPMENT. Send stamp for list. WA4DSO, 3037 Audrey Drive, Gastonia NC 28054. RF559

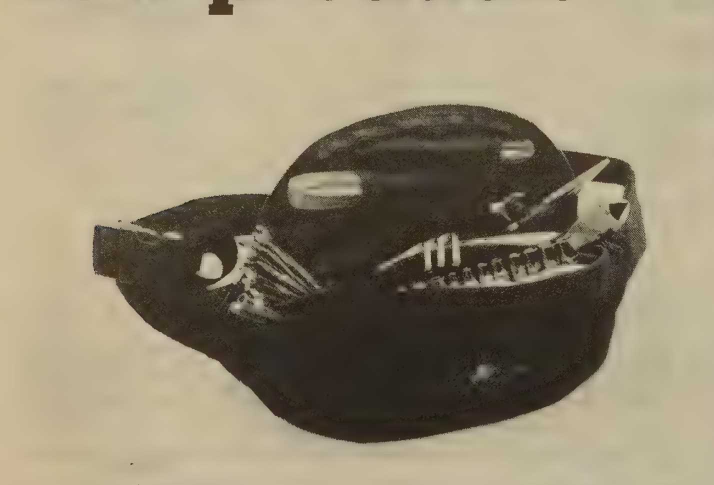
2-METER THRU-THE-GLASS ANTENNA. Cellular phone look-alike, all brass and stainless steel, proven design, low SWR, removable for $20.00 PPD or the same antenna with 15 feet of coax and silver PL-259 connector all ready for $26.00 PPD. N8SBP John Swanson, 45075 Mayo Ct., Northville MI 48167> RF808

VIDEOCIPHER /SATELLITE/ SCANNER/ CABLE/ AMATEUR/ CELLULAR. Repair Manuals, Modification Books & Software. Catalog-$3.00. TELECODE P.O. Box 6426-RF, Yuma AZ 85366-6426. RF963

SECRET SCANNER Frequencies: Federal, Police, Aero, Military, Cellular, Surveillance, also SWL & CB Books. Big FREE catalog! CRB Research, Box 56-RF, Commack NY 11725. RF996

AMATEUR RADIO REPAIR!! All makes-maximum labor per unit, $80.00. TELO (Dan), 1302 S. Uplands Dr., Camano Island WA 98292. (206) 387-3558. RF999

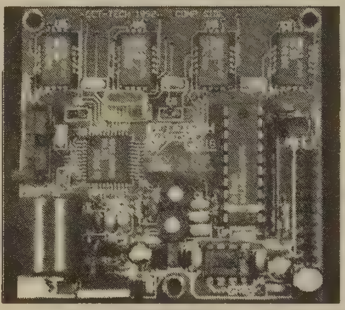
new products



PAKTEK INC.

PAKTEK Inc. is now offering the TOOLPAKS product line. The TOOLPAK original is a backpack tool organizer that secures over 100 of your most needed and important tools; the FANNYPAK is a convenient way to carry those few tools you just can't be without. Perfect for Field Day or remote locations, TOOLPAKs eliminate chasing down tools, keeping those days in the field fun and exciting. FANNYPAK has room enough for your portable and all the extra batteries, leaving both of your hands free. Made of durable abrasion- and puncture-resistant Cordura, the TOOLPAKS haul like a pack and open like a zippered file cabinet, keeping you organized and helping you work more efficiently.

For prices and more information, contact *PAKTEK Inc., 7307 82nd St. Ct. S.W., Tacoma WA 98498; (800) 258-8458, Fax: (206) 589-1091.* Or circle Reader Service No. 201.



GET-TECH

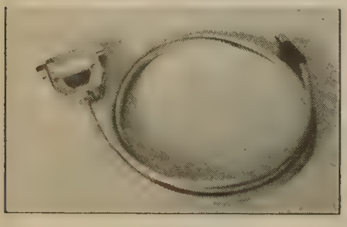
GET-TECH has released its digital voice recorder, AUDIO Q218. This unit will record up to 218 seconds of speech. With four selectable sample rates, up to eight different variable-length messages may be stored. Two separately adjustable audio outputs are provided. One high-level output will drive a speaker to 400 mW; the other may be used for output to an external amplifier or transmitter. An on-board regulator allows use from 8 to 15 VDC. Also included is an open collector output for keying a transmitter or external device during playback. The 2.5" x 2.5" unit comes fully assembled and tested, including battery backup and 4 meg RAM.

The AUDIO Q-218 is priced at $149, plus S & H. For more information, contact *GET-TECH, 201 Riley Road, New Windsor NY 12553; (914) 564-5347.* Or circle Reader Service No. 203.

OPTOELECTRONICS

Optoelectronics has announced a new addition to the Communications Interceptor product line, the pager-sized Model R20 AM Communications Interceptor. The AM Interceptor is a modern version of the crystal detector radio, with microwave diodes and transistors replacing the chunk of galena. A 10-LED bargraph provides a relative signal level display using 3 dB steps, for all RF signals that are detected. The frequency covered is from 0.5 MHz to over 2.5 GHz. An earphone can be used to monitor the detector output. The automatic level circuitry replaces the need for an external volume control and also protects the listener from strong signals that may produce uncomfortably loud transients. The R20 AM Interceptor can be used to check two-way radios for RF output, make RF signal strength measurements, locate stuck transmitters, test microwave ovens for leakage, locate RF listening devices (bugs), and listen to any AM modulated signal, including CB and aircraft two-way transmissions.

The Model R20 FM Communications Interceptor is priced at $119. For more information, contact *Optoelectronics, 5821 NE 14th Avenue, Fort Lauderdale FL 33334; (305) 771-2050, (800) 327-5912, Fax: (305) 771-2052.* Or circle Reader Service No. 204.



j•COM

j•COM has introduced a line of Transceiver Control Computer Interface cables designed to interface personal computers with all receivers and transceivers which have the ability to be controlled over a serial TTL link. The j•COM interface cable requires no external power supply. The unit requires only 3.5 mA of total power for ICOM and Yaesu models, and 6 mA for Kenwood. Removing the external power supply and its associated cables significantly reduces the susceptibility of the interface to RFI from the transmitter. Emitted RF noise is also reduced. The entire interface has been sandwiched into the shielded hood of a DB-25 connector compatible with the serial interface of most PC compatible computers. j•COM also supplies an optional DB-9 to DB-25 adapter for use with computers using the smaller size "AT" connector. Because the interface is a direct replacement for the manufacturer's own units, it is fully compatible with all rig control software.

The four models of interface cable come completely assembled and ready to plug in. All four are priced at $54.95, plus $5 S & H. j•COM provides a 30-day money-back guarantee and a 90-day parts and labor warranty. Contact *j•COM, Box 194, Ben Lomond CA 95005; (408) 335-9120, Fax: (408) 335-9121.* Or circle Reader Service No. 205.

TRIPP LITE

The DataShield S100 surge suppressor from Tripp Lite features multiple component circuitry that effectively stops surges, spikes, line noise and RFI/EMI interference. Exclusive features include hard disk protection, with a low voltage alarm and flashing indicator light to warn of substandard voltage conditions before hard disk damage can occur. Manual reset prevents unstable voltages, common after power is restored, from damaging connected equipment. The S100 also features SurgeSurance®, which provides for the repair or replacement of the S100 and connected equipment if damaged by a surge (including direct lightning strikes), for life.

For the price and more information, contact *Tripp Lite, 500 N. Orleans, Chicago IL 60610-4188; (312) 329-1777, Fax: (312) 644-6505.* Or circle Reader Service No. 202.

Uncle Wayne's Bookshelf

BOOKS FOR BEGINNERS

20N018 **Technician Class License Manual: New No-Code** *by Gordon West* This book will cover everything you need to become a Technician Class Ham. Every exact question and answer on the examinations is found in this one book covering element 2 and element 3A question pools. Gordon West tells you the right answer and then explains in detail why the answer is correct. Fully illustrated text, frequency chart showing privileges, list of examiners and an FCC Form 610 application. **$9.95**

20N092 **The Wonderful World of Ham Radio** *by Richard Skolnik, KB4LCS* This book addresses the plea that something simple, clear, and fun be written to introduce young people to amateur radio. Pick one up for the new ham in your life. **$7.95**

20N099 **Digital Electronics Projects for Beginners** *by Owen Bishop* contains 12 digital electronics projects suitable for the beginner to build with the minimum of equipment. 128 pp., 56 line drawings **$12.50**

20N100 **Electronics Build and Learn (2nd Ed.)** *by RA Penfold* combines theory and practice so that you can "learn by doing." Full construction details of a circuit demonstrator unit that is used in subsequent chapters to introduce common electronic components. Describes how these components are built up into useful circuits, oscillators, multivibrators, bistables, and logic circuits. 128 pp., 18 photos, 72 line drawings. **$12.50**

AR2073 **Novice Antenna Notebook** A beginners guide to easy and effective antennas and tuners you can build. **$9.50** An ARRL Publication.

AR2871 **W1FB's Help for New Hams** *by Doug DeMaw W1FB* Complete for the newcomer. Put together a station and get on the air. **$10.00** An ARRL Publication.

AR2286 **First Steps in Radio** *by Doug DeMaw W1FB* Series of *QST* articles. See components assembled into practical circuits and how the circuits make up your radio gear. **$5.00** An ARRL Publication.

AR3291 **Now You're talking: Discover the World of Ham Radio** Successor to the immensely popular *Tune in the World with Ham Radio.* Covers everything you need to know to earn your first Amateur Radio license. More than a study guide, this book will help you select equipment for your ham radio station and explain how to set it up — everything you'll need to know to get on the air! An ARRL Publication. **$19.00**

AR3292 **Your Introduction to Morse Code: Practice Cassettes** companion code course to *Now You're Talking!*, this kit includes two 90 minute cassette tapes. Prepares you for the 5 WPM Morse Code exam to earn your Novice license or add high-frequency worldwide communications privileges to your code-free Technician license. **$10.00**

20N021 **No Code Ham Radio Education Package** Computer software package. Clear, concise. and easy to understand. This package includes computer aided instruction software (IBM compatible). 200 page Ham Radio Handbook, and complete FCC Part 97 Amateur Radio rules and regulations. No prior knowledge of electronics is needed. **$28.95**

20N022 **Ham Operator Education Package** Computer software contains five IBM compatible discs with all questions for all license classes, plus "Morse Academy" code teaching software that takes you from 0-20 wpm. Effortless and uncomplicated, everything is done from easy to understand menus. Review all questions, print out sample tests or take exams administered right at the computer keyboard. **$28.95**

SHORTWAVE

06S57 **1992 Passport to World Band Radio** *by International Broadcasting Services, Ltd.* You can have the world at your fingertips. You'll get the latest station and time grids, the 1992 Buyer's Guide and more. 384 pages. **$16.50**

07R25 **The RTTY Listener** *by Fred Osterman* New and expanded version. This specialized book compiles issues 1 through 25 of the *RTTY Listener Newsletter.* It contains up-to-date, hard-to-find information on advanced RTTY and FAX monitoring techniques and frequencies. 224 pages. **$19.95**

09S42 **The Scanner Listener's Handbook** *by Edward Soomre N2BFF* Get the most out of your scanner radio. Covers getting started, scanners and receivers, antennas, coaxial cable, accessories, computer controlled monitoring, more. **$14.95**

03S208 **Radioteletype Press Broadcasts** *by Michael Schaay* Covers schedules of Press Services by time, frequency, and country broadcasting in English, French, German, Spanish, and Portuguese. Detailed Press Agency Portraits. 120 pp. **$12.95**

03K205 **Guide to Radioteletype (RTTY) Stations** *by J. Klingenfuss* Updated book covers all RTTY stations from 3MHz-30MHz. Press, Military, Commercial, Meteo, PTTs, embassies, and more. 105 pp. **$12.95**

11RF13 **The "Top Secret" Registry of US Government Radio Frequencies (7th Ed.)** *by Tom Kneitel K2AES* This scanner directory has become the standard reference source for frequency and other important information relating to the communications of federal agencies. 25 to 470 MHz. **$19.95**

11F52 **Ferrell's Confidential Frequency List, New Revised Edition** *compiled by A.G. Halligey* All frequencies from 4 MHz-28MHz covering ship, embassy, areo, Volmet, Interpol numbers, Air Force One/Two, more. 376 pp. **$19.50**

11EE06 **Guide to Embassy Espionage Communications** *by Tom Kneitel K2AES* Candid and probing examination of worldwide embassy and (alleged) espionage communications systems and networks. Extensive nation-by-nation directory of embassy stations is included. **$10.95**

STUDY AIDS

VIS Study Cards
Advance the easy way with VIS Study Cards. Compact. Up-to-date Flash Cards with Key Words Underlined, Quiz on back. Formulas worked out. Schematics at your fingertips. Used SUCCESSFULLY by ages 6 to 81!

NOVICE	VIS01	$11.95
TECH	VIS02	10.95
GENERAL	VIS03	9.95
ADVANCED	VIS04	15.95
EXTRA	VIS05	14.45

Lanze Code Programs—(Available on 5 1/4" disk.)
Inexpensive complete study guide code programs for both the C64/128 Commodores and the IBM compatibles. Programs include updated FCC questions, multiple choice answers, formulas, schematic symbols, diagrams, and simulated (VE) sample test.

	IBM Part#	Commodore Part#	Price
Novice	IBM01	COM01	$14.95
Tech	IBM02	COM02	$14.95
General	IBM03	COM03	$14.95
Advance	IBM04	COM04	$19.95
Extra (New Pool)	IBM05	COM05	$19.95

IBM06, COM06 IBM/Commodore Tech No Code—Lanze Code Program contains all the authorized FCC questions and answers used in testing formulas, schematic symbols, diagrams, and sample test for passing the new Technician No Code license. **$24.95**

ANTENNAS

05A95 **Easy-up Antennas for Radio Listeners and Hams** *by Edward M. Noll* Like to learn how to construct low-cost, easy-to-erect antennas? *Easy-up Antennas* will help you. **$16.50**

10A345 **Beam Antenna Handbook** *by William Orr W6SA1/Stuart Cowan W2LX* Yagi beam theory, construction, operation. Wire Beams, SWR curves. Matching systems. A "must" for serious DXers. **$11.95**

10A343 **All About Cubical Quad Antennas** *by William Orr W6SA1/Stuart Cowan W2LX*The "Classic" on Quad design, theory, construction, operation. New feed and matching systems. New data. **$9.50**

10A346 **Simple, Low-cost Wire Antennas for Radio Amateurs** *by William Orr W6SA1/Stuart Cowan W2LX* All New! Low-cost, multi-band antennas; inexpensive beams. "Invisible" antennas for hams in "tough" locations! New data. **$11.50**

01A70 **Practical Antenna Handbook** *by Joseph J. Carr* Design, build, modify, and install your own antennas. Carr, a 20-year veteran of technical writing, has a unique ability to present complex technical concepts in an easy-to-understand way. 416 pp. **$21.50**

20N108 **The Easy Wire Antenna Handbook** *by Dave Ingram K4TWJ* Get out your roll of wire and your wire cutters, you are ready to go with this new practical and easy to understand book. Gives you all of the needed dimensions for a full range of easy to build and erect "sky wires." Covers all of the many types of wire antennas along with a lot of his antenna secrets and "how-to-do" helps. **$9.50**

UHF/VHF PACKET

03R02 **RTTY Today** *by Dave Ingram K4TWJ* Only up-to-date RTTY book in existence. Covers all facets of RTTY. Most comprehensive RTTY guide ever published. Fully illustrated. 112 pages. **$8.50**

01P22-2 **The Packet Radio Handbook (2nd Ed.)** *by Jonathan L. Mayo KR3T* "...an excellent piece of work. Well worth reading for both the experienced and the new packeteer...the definitive guide to amateur packet operation."—Gwyn Reedy W1BEL **Only $15.00**

20N019 **U.S. Repeater Mapbook** *by William Smith N6MQS* The Guide for traveling radio amateurs gives you repeater frequencies, and locations on easy to read state map. Includes all 50 states and 28—1200 MHz. **$9.95**

ARRL BOOKS

AR1992 **ARRL 1992 Handbook (68th Ed.)** 39 chapters, featuring 2,100 tables, figures and charts. The most comprehensive, well organized and affordable source of amateur radio reference material. 1232 pages. **$25.00**

AR1086-4 **ARRL Operating Manual (4th Ed.)** Packed with information on how to make the best use of your station, including: interfacing home computers. OSCAR, VHF-UHF, contesting **$17.00**

AR0194 **Antenna Compendium Vol. 1** Materials on verticals, quads, loops, yagis, reduced size antennas, baluns, Smith Charts, antenna polarization, and other interesting subjects. **$10.00**

AR2545 **Antenna Compendium Vol. 2** 42 papers covering verticals, yagis, quads, multiband and broadband systems, antenna selection, and much more. **$12.00**

AR2626 **Companion Software for Antenna Compendium Vol. 2** 5 1/4" MS-DOS floppy. **$10.00**

AR0488 **W1FB's Antenna Notebook** *by Doug DeMaw W1FB* Get the best performance out of unobtrusive wire antennas and verticals. Build tuners and SWR bridges. **$9.50**

AR0348 **QRP Notebook** *by Doug DeMaw W1FB* Presents construction projects for the QRP operator, from a simple 1 watt crystal-controlled transmitter to more complex transceiver designs. **$9.50**

AR4141 **W1FB's Design Notebook** *by Doug DeMaw W1FB* This plain language book is filled with simple practical projects that can be built using readily available components and common hand tools. **$10.00**

AR1033 **The DXCC Companion** *by Jim Kearman KR1S* spells out in simple, straightforward terms what you need to be a successful DXer. **$6.00**

ARRL License Manuals All the theory you need to pass your test. Complete FCC question pools with answers.

AR2375 **Technician Class**	$6.00
AR2383 **General Class**	$6.00
AR0166 **Advanced Class**	$6.00
AR2391 **Extra Class**	$8.00

AR2171 **Hints and Kinks** Find the answer to that tricky problem. Ideas for setting up your gear for comfortable, efficient operation. **$8.00**

AR3169 **QRP Classics** Collection of articles from last 15 years of ARRL publications on building receivers, transmitters, transceiver, accessories, 288 pp. **$12.00**

AR2030 **Your Gateway to Packet Radio (2nd Ed.)** Tells everything you need to know about this popular new mode; how to get started, equipment you need, and more. **$12.00**

AR2065 **ARRL Antenna Book** The new 16th Edition represents the best and most highly regarded information on antenna fundamentals, transmission lines, design, and construction of wire antennas. Over 700 pages, over 900 figures. An ARRL Publication. **$20.00**

We carry all ARRL books. Call for Prices!

CODE TAPES

73T05 **"Genesis"** **$5.95**
5 wpm—This is the beginning tape, taking you through the 26 letters, 10 numbers, and necessary punctuation, complete with practice every step of the way.

73T06 **"The Stickler"** **$5.95**
6+ wpm—This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses.

73T13 **"Back Breaker"** **$5.95**
13+ wpm—Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language code at only 13 per.

73T20 **"Courageous"** **$5.95**
20+ wpm—Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the extra class license. We send the code faster than 20 per.

REFERENCE

20N101 **Everyday Electronics Data Book** *by Mike Tooley BA.* Information is presented in the form of a basic electronic recipe book with numerous examples showing how theory can be put into practice using a range of commonly available "industry standard" components and devices. 256 pp. 134 line drawings. **$18.00**

02C30 **The Commodore Ham's Companion** *by Jim Grubbs K9E1.* 160 pages of useful information on selecting a Commodore computer for the ham shack, where to find specialized programs, the Commodore-packet connection, and more! **$9.50**

10F092 **1992 International Callbook** The New 1992 International Callbook lists 500,000 licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions. **$29.95**

10D092 **1992 North American Callbook** The 1992 North American Callbook lists the calls, names, and address information for over 500,000 licensed radio amateurs in all countries of North America, from Panama to Canada including Greenland, Bermuda, and the Caribbean islands plus Hawaii and U.S. possessions. **$29.95**

05H24 **Radio Handbook, 23rd Ed.** *by William I. Orr W6SA1* 840 pages of everything you wanted to know about radio communication. In-depth study of AC/DC fundamentals, SSB, antennas, amplifiers, power supplies, and more. **$29.50 hard cover only.**

01D45 **The Illustrated Dictionary of Electronics, 5th Ed.** *by Rufus P. Turner and Stan Gibilisco.* Featuring more than 27,000 entries, an exhaustive list of abbreviations, and appendices packed with schematic symbols and conversion tables, this is by far the most comprehensive dictionary of practical electronics and computer terms available. 720 pages **$26.95**

02B10 **Heath Nostalgia** *by Terry Perdue K8TP* A brief history of the Heath Company of Benton Harbor, Michigan - with fond memories of and by those who were responsible for the Heathkit name becoming world famous.**$9.50**

04M54 **GGTE Morse Tutor** From beginner to Extra class in easy self-paced lessons. Code speeds from 1 to over 100 words per minute. Standard or Farnsworth mode. Adjustable tone frequency. Create your own drills, practice or actual exams. Exams conform to FCC requirements. 5 1/4 floppy for IBM PC, XT, AT, PS/2 or compatibles. **$19.50**

04M55 **Advanced Edition** **$29.95**

IBM97 **Amateur Radio Part 97 Rules** Includes updates, revised Commissions's Rules, (September 30, 1989) 5 1/4" disk IBM compatible only. **$9.95**

20N096 **How To Read Schematics (4th Ed.)** *by Donald E. Herrington* Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. This book is your key to unlocking the mysteries of schematics, beginning with a general discussion of electronic diagrams. **$14.95**

20N097 **Radio Operator's World Atlas** *by Walt Stinson, W0CP* This is a compact (5x7), detailed, and comprehensive world atlas designed as a constant desk top companion for radio operators, and as a replacement for the traditional bulky and outdated atlases. Also included are 42 pages of vital statistics about each country. Popular with DXers worldwide. **$17.95**

20N020 **Secrets of RF Circuit Design** *by Joseph J. Carr* Written in clear non-technical language, covers everything from antennas to transistors. You will learn the basics of receiver operation, the proper use and repair of components in RF circuits, the principles of radio signal propagation from low frequencies to microwave, and much more! **$19.50**

20N109 **73 Magazine Index 1960-1990** A complete index to every article published in *73 Magazine* through 1990. Eleven major categories, further subdivided into 25 individual subject areas, provides easy access to thousands of articles, and a wealth of technical information. **Book$15.00**
IBM software (specify type) $20.00

20N110 **Product Reviews Since 1945** Contains an index to 3,400 product reviews that have appeared in *QST, CQ, HR, 73* and *Radcom.* Alphabetically listed by manufacturer. **Book $12.95**

73 Amateur Radio Today

PUT SOME EXCITEMENT INTO YOUR HOBBY!!

No other magazine brings you the exciting world of amateur radio like *73 Amateur Radio Today.*

Equipment reviews you can use. Construction projects for all abilities. More antenna articles than any other magazine. Monthly columns covering the exciting worlds of RTTY, ATV, microwaves, QRP, DX, foxhunting and more. "Never Say Die," Wayne Green's monthly view of the world of amateur radio.

12 issues for $19.97 That's a 43% savings off the newsstand price!

CALL 1-800-289-0388

or send $19.97 to: ***73 Amateur Radio Today***
70 Rte. 202N, Peterborough, NH 03458

Uncle Wayne's Bookshelf Order Form

You may order by mail telephone, or fax. All payments are to be in US funds. Allow 3 weeks for delivery.

Item #	Title	Qty.	Price	Total
			SHIPPING	
			TOTAL	

Shipping
US add $3.00 mail, $4.00 UPS
Canada add $4.00 mail.
UPS to Canada and all foreign orders FOB Peterborough, NH.
Foreign orders will be billed actual shipping charges.

Name ____________________

Street ____________________

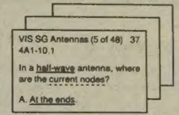
City ____________ State ________ Zip ________

TOTAL $ __________ ☐AE ☐MC ☐VISA ☐Check/Money Order

Card # ____________________ Expiration Date ____________

RF1292

Telephone: (603) 924-4196 (800) 234-8458 FAX: (603) 924-8613
Mail: *73 Magazine*, Attn. Uncle Wayne, PO Box 3080, Peterborough, NH 03458



VIS SG Antennas (5 of 48) 37
4A1-10.1
In a half-wave antenna, where are the current nodes?
A. At the ends.

QUICK, EASY, & COMPACT

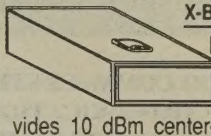
Flash cards * NOVICE thru EXTRA * theory Key words underlined. Over 2000 sets in use! For beginner, OMs, XYLs & kids.

NOVICE	$11.95
TECHNICIAN	$10.95
GENERAL	$ 9.95
ADVANCED	$15.95
EXTRA	$14.45
Shipping	1—$ 3.00
2 or more	—$ 4.00
CLUB DISCOUNTS	

Order Today! from

VIS STUDY CARDS
P.O. BOX 16646
HATTIESBURG, MS 39404

CIRCLE 104 ON READER SERVICE CARD



X-BAND TRANSMITTER

Miniature (2¼ x 3¾ x 1") GaAs microstrip transmitter provides 10 dBm centered at 10.525 GHz. Integrated microstrip patch antenna eliminates the need for an external antenna. Advanced matching techniques secured good temperature stability with low frequency pulling. Great for long-range testing of radar detectors, calibration of radar receiving equipment, and point-to-point communication links.

Complete Assembled System $39.00
Parts & Instruction Kit $29.00

Plus $2.00 Shipping and Handling

INNOTEK Inc.
P.O. Box 80096, Fort Wayne, IN 46898
(219) 489-1711

Visa • MasterCard • Check • Money Order • COD
Money-Back Guarantee

CIRCLE 293 ON READER SERVICE CARD

HUGE NEW CATALOG

Call or write Universal today to receive your free 100 page catalog with prices!

- Communications Receivers
- Portable Receivers
- Amateur Transceivers
- Amateur & SWL Antennas
- Scanners
- RTTY and FAX Equipment
- Books and Manuals
- All major lines: Kenwood, Icom, Yaesu, Alinco, MFJ, Japan Radio, AEA, Sony and Sangean.

This catalog is available FREE by fourth class mail, or for $1 by first class mail.

☞ **Universal Radio**
6830 Americana Pkwy.
Reynoldsburg, OH 43068
◆ Tel. 614 866-4267
◆ Tel. 800 431-3939
◆ FAX 614 866-2339

Universal-quality equipment since 1942!

Subscribe To
Radio Fun
Call
1-800-257-2346

ELECTRONIC DISTRIBUTORS
AUTHORIZED DEALERS

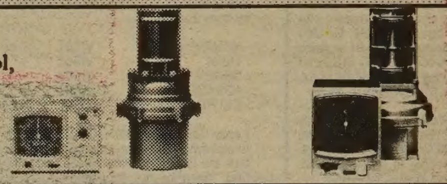
EDCO Family of Products . . .
CREATE, EMOTO and DAIWA

ACK RADIO SUPPLY	AL	205-322-0588
ADVANCED SPECIALTIES	NJ	210-843-2067
AMATEUR & ADV. COMM.	DE	302-478-2757
AMATEUR RADIO SUPPLY	WA	206-767-3222
ASSOCIATED RADIO	KS	913-381-5900
BANCOM COMMUNICATIONS	LA	504-277-6815
BARRY ELECTRONICS	NY	212-925-7000
BLUE WATER COMM.	MI	313-679-3535
BROWNVILLE SALES CO	WI	715-644-2112
BURGHARDT AMATEUR CTR	SD	605-886-7314
CC DISTRIBUTORS	CA	714-354-8630
C-COMM	WA	800-426-6528
COLORADO COMM. CENTER	CO	303-288-7373
CONDOR COMMUNICATION	FL	305-324-0123
CUSTOME COMMUNICATIONS	NY	718-447-4747
DAN'S COMMUNICATIONS	RI	401-392-3215
DJ SYTEMS	FL	407-845-7021
DUBOSE COMMUNICATIONS	SC	803-773-3899
ELECTRONIC EQUIP. BANK	VA	800-368-3270
ELECTRONIC SPECIALIST	NC	919-791-8885
ELIS AMATEUR RADIO	FL	305-525-0103
ENVIRONMENTAL ENT.	MN	612-789-0202
FRANK BEIER RADIO INC.	LA	504-837-2680
GEMEC	SC	800-543-6326
HC VAN VALZAH CO.	IL	708-852-0472
HR ELECTRONIC	MI	616-722-2246
HAM RADIO OUTLET	CA	800-854-6046
HAM STATION	IN	800-729-4373
HAMTRONICS ELEC.	PA	800-426-2820
HARDIN ELECTRONICS	TX	817-429-9761
HENRY RADIO	CA	800-877-7979
HIALEAH COMMUNICATION	FL	305-888-5040
HIRSCH SALES CO.	NY	716-632-1189
INTERNATIONAL RADIO	FL	305-594-4313
JRS DISTRIBUTORS	PA	717-854-8624
JUNS ELECTRONICS	CA	213-390-8003
K-COMM INC.	TX	800-344-3144
LARUE ELECTRONICS	PA	717-343-2124
LENTINI COMMUNICATIONS	CT	800-666-0908
MARYLAND RADIO CTR.	MD	301-725-1212
MEMPHIS AMATEUR	TN	800-238-6168
MICHIGAN RADIO	MI	313-771-4711
MIKES ELECTRONICS	FL	305-491-7110
MT. PLEASANT RADIO CO.	SC	803-881-0596
N & G DISTRIBUTING	FL	305-592-9685
NORTH OLMSTEAD AMA. RAD.	OH	216-777-9460
OMAR ELECTRONICS	GA	404-446-3241
PORTLAND RADIO SUPPLY	OR	503-233-4904
QUAD ELECTRONICS	FL	904-438-3319
R & L ELECTRONICS	OH	800-221-7735
R & L ELECTRONICS	IN	800-524-4889
RF ENTERPRISES	MN	800-233-2482
RADIO WORK	VA	804-484-0140
RAYS AMATEUR ELEC	NC	919-883-6038
ROSS DIRSTRIBUTING	ID	208-852-0830
SATELLITE CITY	MN	612-786-4475
TEXAS TOWERS	TX	214-422-7306
UNIVERSAL AMATEUR RADIO	OH	800-431-3939
VHF COMMUNICATIONS	NY	716-664-6345
WALCOTT SALES	IA	800-628-6299

Contact your favorite dealer today! If you require any additional information not available from your dealer, please contact EDCO (703-938-8105). We'll be glad to provide specs, answer questions and direct you to your nearest stocking dealer!

EMOTO ... a new generation of rotators, out to set high standards!

Large machined steel gears, adjustable centering mast clamp, preset and computer control, friction braking, circular position indicators, solid state controllers for smooth start/stop, uses 7 conductor cable. The serious rotator!

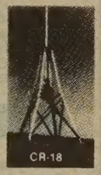


The CREATE Family of Rotators, Roof Top Towers and High Gain Antennas were designed for the long term reliability!

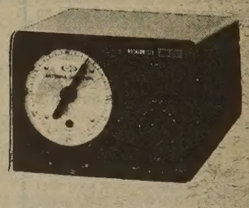
CREATE High Grade Aluminum Roof Towers for all your antenna requirements.

As always guying is recommended to insure your safety.

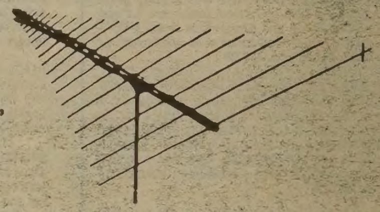
Roof Towers		base	max. width	max. vert.	
model	height	width	load ft.2	load lbs.	weight
CR18	5'10"	31 1/2"	21@90mph	440	18
CR30	9'10"	39"	27@90mph	1,322	333
CR45	14'9"	39"	23@90mph	881	57



CREATE Rotator Features: RC-5
Cast and machined aluminum case,
Water tight connector, Worm drive
brake gearing, Long term reliability,
Auto, mast clamp guides, Preset (on 3 models),
Circle overlay available for U.S.A.



CREATE Log Periodics wide-band, VHF/UHF antennas are excellent for DX'ing, Amateur radio, FM broadcast, Scanners, and more.
CLP5130-1: Frwd gain 10-12dB, Front to back ratio15dB, 23 elements, Transmit power to 500W, Boom length 5.8ft, VSWR 2.0:1 or less, Max. longest element 9.8ft, 11lbs, Wind survival 90mph.
CLP5130-2: 105-1300Mhz, 19 ele, boom 4.6ft., longest ele. 4.6ft.

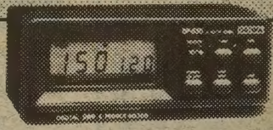


DAIWA's quality continues . . .proven reliability for today's Amateur!

Cross Needle and Digital SWR/Power Meters.
Rugged, efficient, low cost answer to SWR/Power measurement.

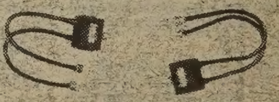
model	freq.range	fwd.power	connectors
CN-101	1.8-150MHz	1.5/150W/1.5kW	SO-239
CN-103	140-525MHz	20/200W	SO-239 or N
DP-810	1.8-525MHz	0-1.5kW/0-15W	SO-239
DP-820	140-525MHz	0-150W	N
DP-830	1.8-150MHz/ 140-525MHz	0-1.5kW	SO-239 & N

other meters available



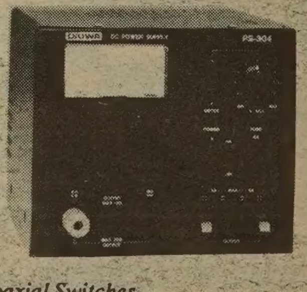
Power Supplies Daiwa power supplies provide reliable, regulated DC Power and Short Circuit/Crowbar protection protects your rig in the unlikely event of power supply failure. All Daiwa Power supplies are 120V 50/60Hz. Also available 220V 50/60Hz.

NEW PS-50T
5 Amp Power Supply, compact styling
Input voltage 50-60Hz, 120W
Output voltage 13.8VDC, 5.5lbs.



PS-304 30 Amps ICS, 24 Amps Cont.,1-15 voltage, 16 lbs.

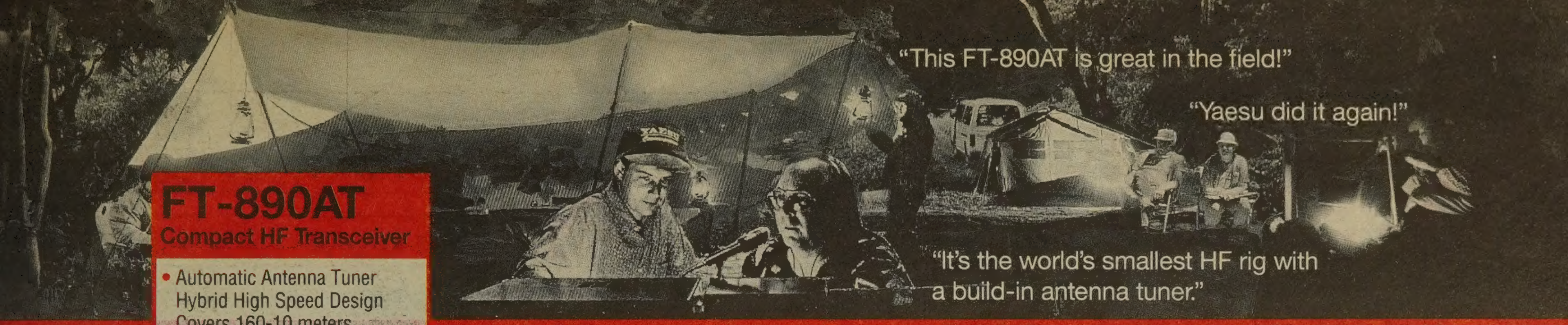
PS-140II
14 ICS, 12 Amps Continuous,
13.8 voltage, 11 lbs.



NEW DUPLEXERS 1.6 - 150MHz/140 - 150MHz/400-460MHz
Power 400W CW/250W CW/200W CW
Power 1kW PEP/500W PEP/400W PEP

Also available are DAIWA Linear Amplifiers and Coaxial Switches.

Electronics Distributors
325 Mill St. Vienna, Va. 22180
PH. 703-938-8105 FAX 703-938-6911



"This FT-890AT is great in the field!"

"Yaesu did it again!"

"It's the world's smallest HF rig with a build-in antenna tuner."

FT-890AT

Compact HF Transceiver

- Automatic Antenna Tuner Hybrid High Speed Design Covers 160-10 meters
- I.P.O. Intercept Point Optimization
- DDS-Direct Digital Synthesis
- F.S.P. Frequency Shift Speech Processor
- General Coverage Receiver 100 KHz to 30 MHz
- Pass Band Shift and 30db Notch Filter
- Noise Blanker with Adjustable Pulse Width
- Built-In Iambic Keyer
- 32 Memories plus 20 VFOs
- FM Repeater Operation Automatic 10 Meter Repeater Offset w/Selectable CTCSS Encode
- All Mode Squelch
- DFCS-Duct Flow Cooling System
- **Accessories:** Contact your Dealer for full details.

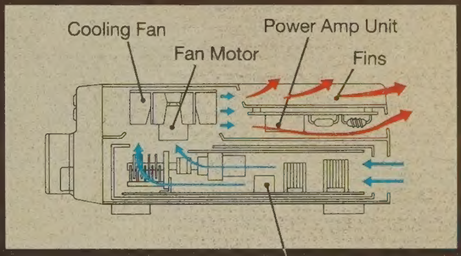
Field days and contesting are challenging. We built the FT-890AT for times when you need the high performance of a base station – like the FT-1000 – but the practicality of a compact, rugged mobile. In fact, the FT-890AT is the mobile version of the FT-1000. Designed to be the world's smallest HF with a built-in antenna tuner, its superior receiving performance is a direct result of FT-1000 technology.

Since field work is demanding, the front panel has been simplified. Seldom used VOX controls are on the back. For faster TX/RX switching, the FT-890AT has two direct digital synthesizers (DDSs). With its unique duct flow cooling system, die-cast aluminum upper case and heat sink, the FT-890AT can't be beat for superior field work and DX-peditions.

Not just a "field" radio, with the optional FP-800 AC Power Supply, MD-1C8 Desk Mic and YH-77ST Headphones you've got a performance-plus base station loaded with features and affordably priced.

To see what that means for you, contact your Yaesu dealer today.

Duct Flow Cooling System (DFCS)
Rugged aluminum top panel heat sink and internal thermally switched fan draws air through the heart of the transceiver.

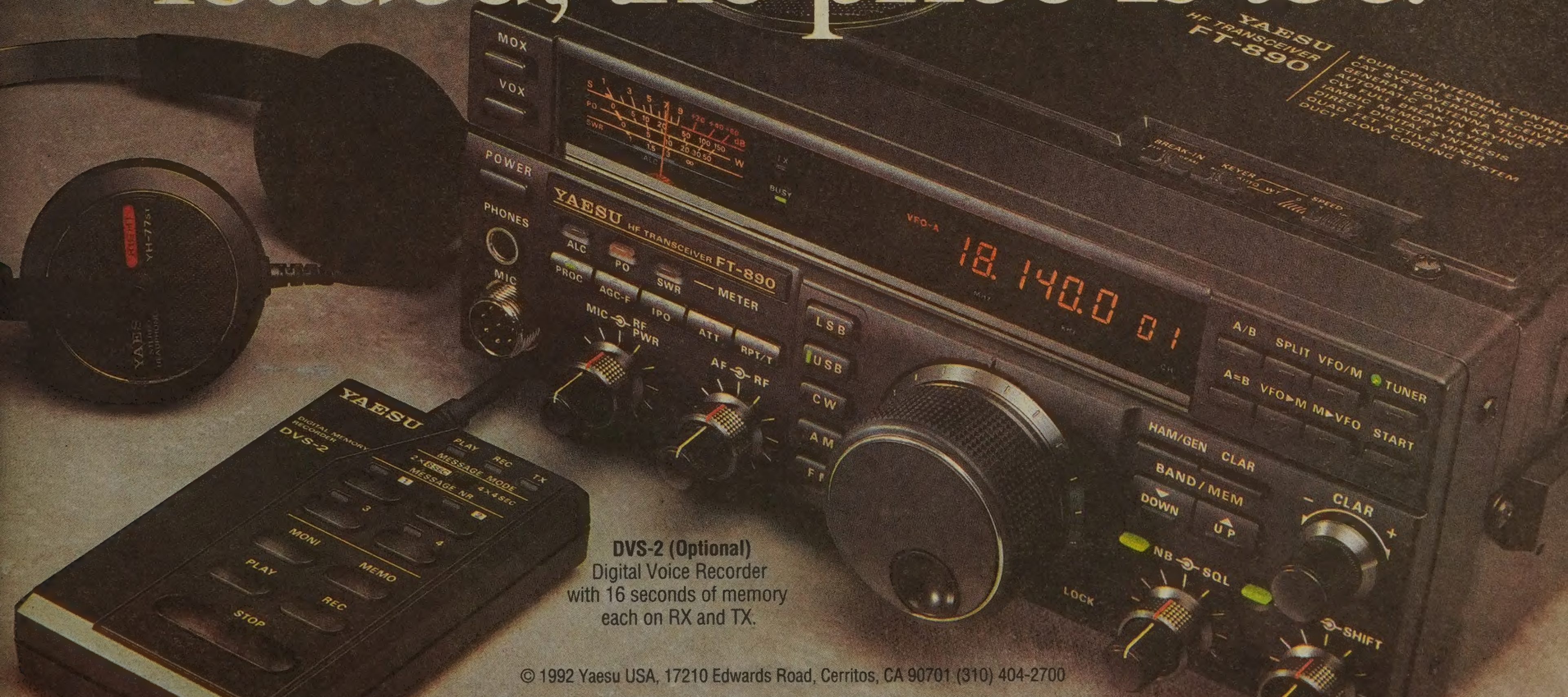


Built-in Antenna Tuner
Tunes most antennas 160-10 meters.

YAESU

*Performance without compromise.*SM

Usually if a rig is this loaded, the price is too.



DVS-2 (Optional)
Digital Voice Recorder with 16 seconds of memory each on RX and TX.

© 1992 Yaesu USA, 17210 Edwards Road, Cerritos, CA 90701 (310) 404-2700

Specifications subject to change without notice. Specifications guaranteed only within amateur bands.
Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

Choose Your Mobile In 3 Easy Steps:

Step 1 Choose Your Bands!

🟥 **Single Band: 2 Meters**

Today's most popular band, the best place for new hams to meet old hands, learn good operating procedures. Very friendly, thousands of open repeaters & autopatches everywhere. Great for on/off-the-road help. Crowded, though, especially in cities. Single-band mobile is easy to learn & use. No-Code friendly!

🟥 **Multiple Band:**
🟨 **2 Meter/440MHz**

The two most popular FM bands. A "natural" mix of high activity & special group channels, this is becoming the amateur's favorite mobile rig. Instant control of either band, and you can set up your station as a crossband full-duplex repeater. Gateway into advanced operating systems unavailable on 2M.

🟨 **440 MHz**

Next most popular band, less crowded with more high-tech, "smart" repeaters offering autopatch, remote base, linking, digital-voice recording. Some are limited-access (PL). Allows crossband repeating between singleband handhelds & dualband mobiles. 440 gives access to advanced technical info. This is where the pros hang out! No-Code friendly!

🟥
🟧 **2Meter/220MHz**

For the unconventional, this combines the most popular & the least crowded bands. Gives access to the people & services on 2M, plus the privacy & open space of 220, plus the advantages of telephone-like duplexing. Valuable where privacy is a concern.

🟧 **220MHz**

Fairly quiet, less crowded than 440, with almost half as many repeaters and the same high-tech functions. Plenty of open channels for semi-private conversation. Great place to meet newcomers, youngsters. Ideal for ham family, since all classes have voice privileges on 220. No-Code friendly!

🟥
🟨
🟪 **2M/440MHz/1.2GHz**

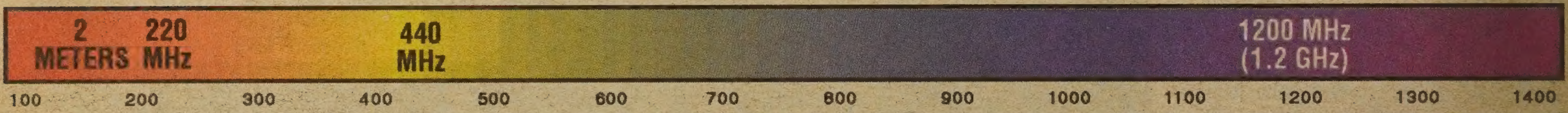
If you live and breathe radio, these are the bands for you! They give you the activity, the expandability and the novelty. Particularly useful for advanced hams who work in the city and live in the suburbs.

🟪 **1.2 GHz**

Radio's new frontier for ham pioneers. Shorter range than 2M or 220/440 in the open, but penetrates buildings, even elevators & underground garages. Excellent for cities. Crystal clear reception. Signals can be "bounced" for distance. Number of repeaters increasing faster than any other band.

🟥
🟨
🟪 **MultiBand**

Widest selection of all: start with 2M/440. Add 6M for No-Code Skywave privileges. Add 10M for Novice and Tech-Plus privileges. Add 1.2GHz for the big city. If you're a shortwave buff, add scanning and SWL. Additional capacity sold as add-on modules.



Step 2 Choose Your Radio!

IC-28H 2 Meters

Ideal starter rig. 45-W single band, 21 memories, LCD display. Receives NOAA/WX

IC-228H 2 Meters

Same as IC-28, w/ color display, more skip & scan features & priority watch.

IC-229H 2 Meters

Even more features – automatic dialing, 50W power, ultracompact case.

IC-449H 440MHz

35W UHF transceiver, 20 memories, scanning, optional autodial.

IC-38A 220MHz

Same as IC-228H, with 220's privacy, 25W & 21 memory channels.

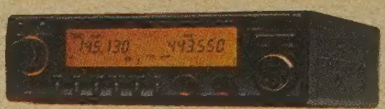
IC-1201 1.2 GHz

A natural for the city. Penetrates structures. 10W output, 20 memories & priority watch.

IC-3230A/H 2 Meter/440 MHz

One touch control, color-coded controls. 25/45W output, simultaneous reception, crossband repeat, 15 memories/band.

IC-2410A/H 2 Meter/440MHz



Same functions as IC-3230, plus ParaWatch for receiving 2 signals on same band simultaneously.

IC-2330A/H 2 Meter/220 MHz

Most popular & least used bands combined. One-touch control. 36 memories/band, variable power output, hi-res display.

IC-901 Modular MultiBand

World's only 6-band mobile amateur radio. 2M/440MHz standard. Optional 220MHz, 1.2GHz, 10M, 6M, 2M-SSB, or wideband receiver.

CIRCLE 179 ON READER SERVICE CARD

Step 3 Choose ICOM!

Free Brochure Hotline
1-800-999-9877

ICOM America, Inc., 2380 116th Ave N.E., Bellevue, WA 98004
All stated specifications subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. SM1092

ICOM
Experience the Quality®